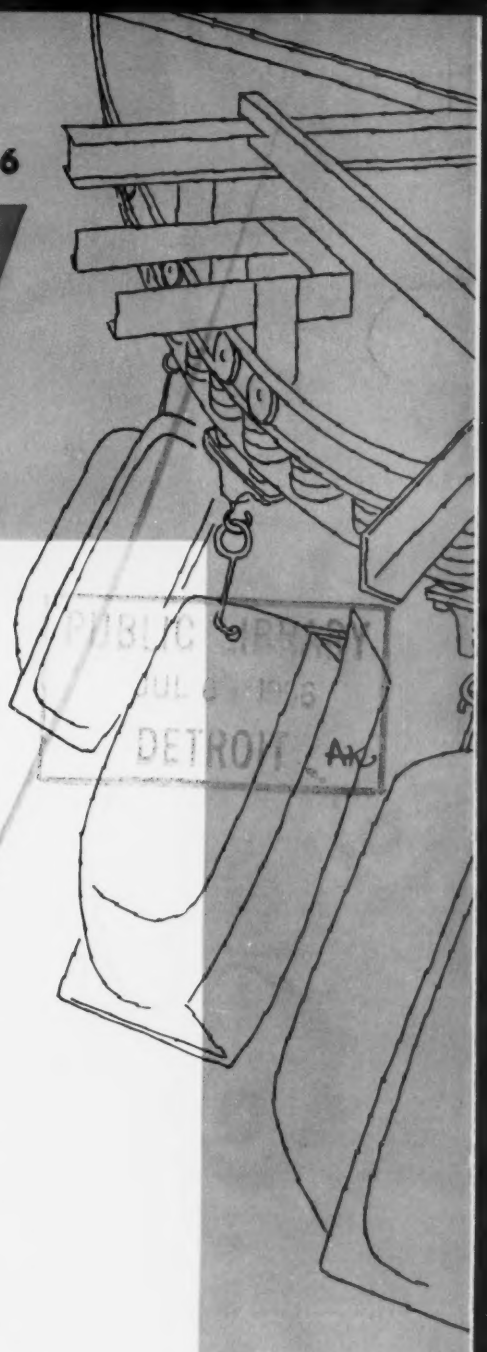
JULY 1956

FOUNDRY

A PENTON PUBLICATION



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DETROIT, MICH.

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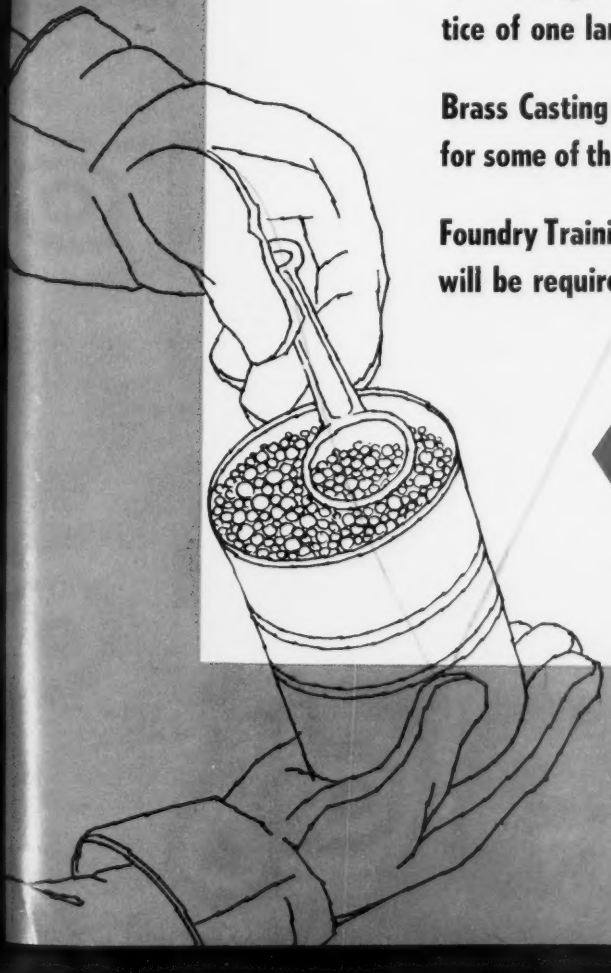

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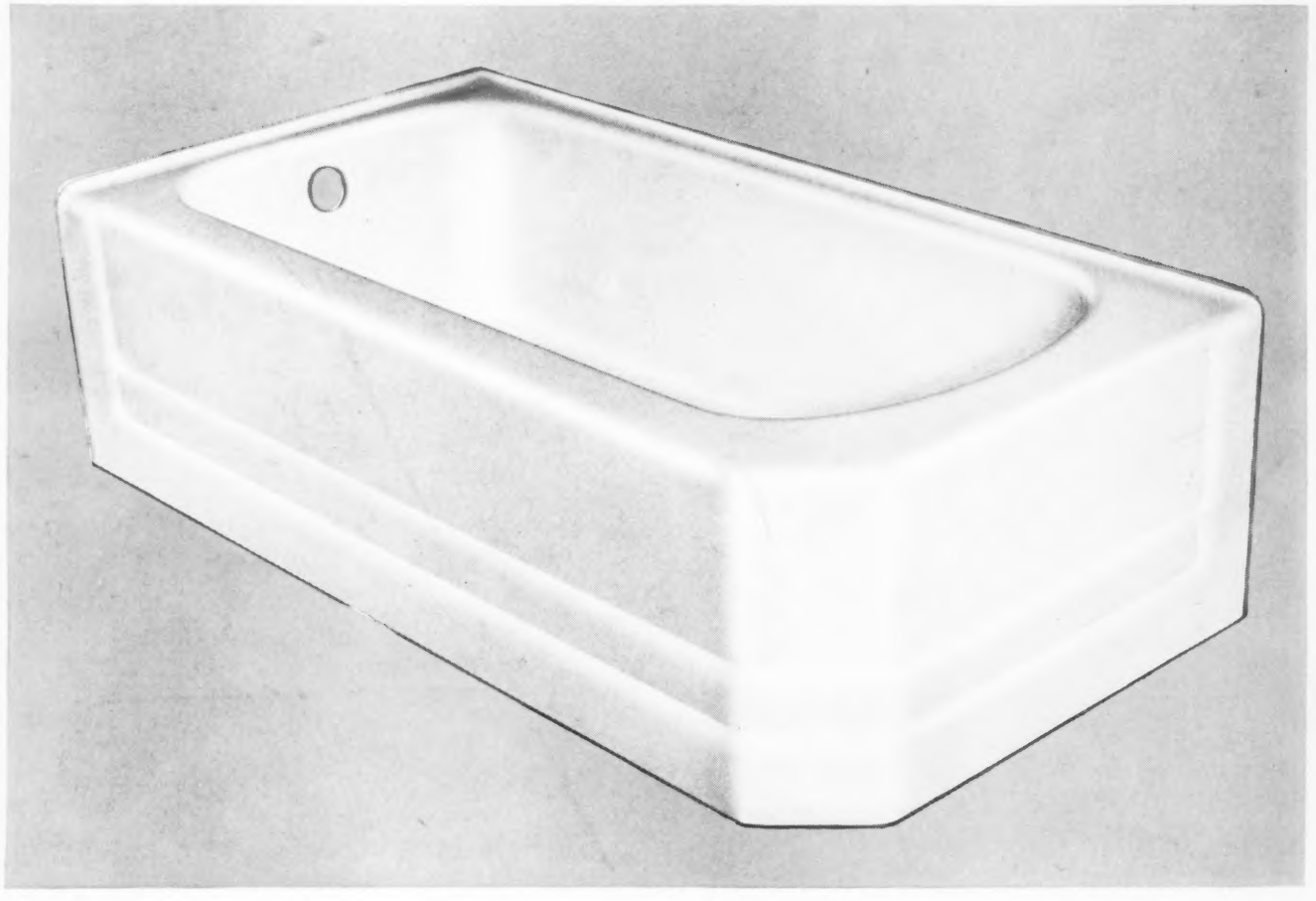

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FREE BOOKLET... gives instructions for use of FERROCARBO® ...advantages, results. Write The Carborundum Company, Dept. F 84-64, Niagara Falls, New York.

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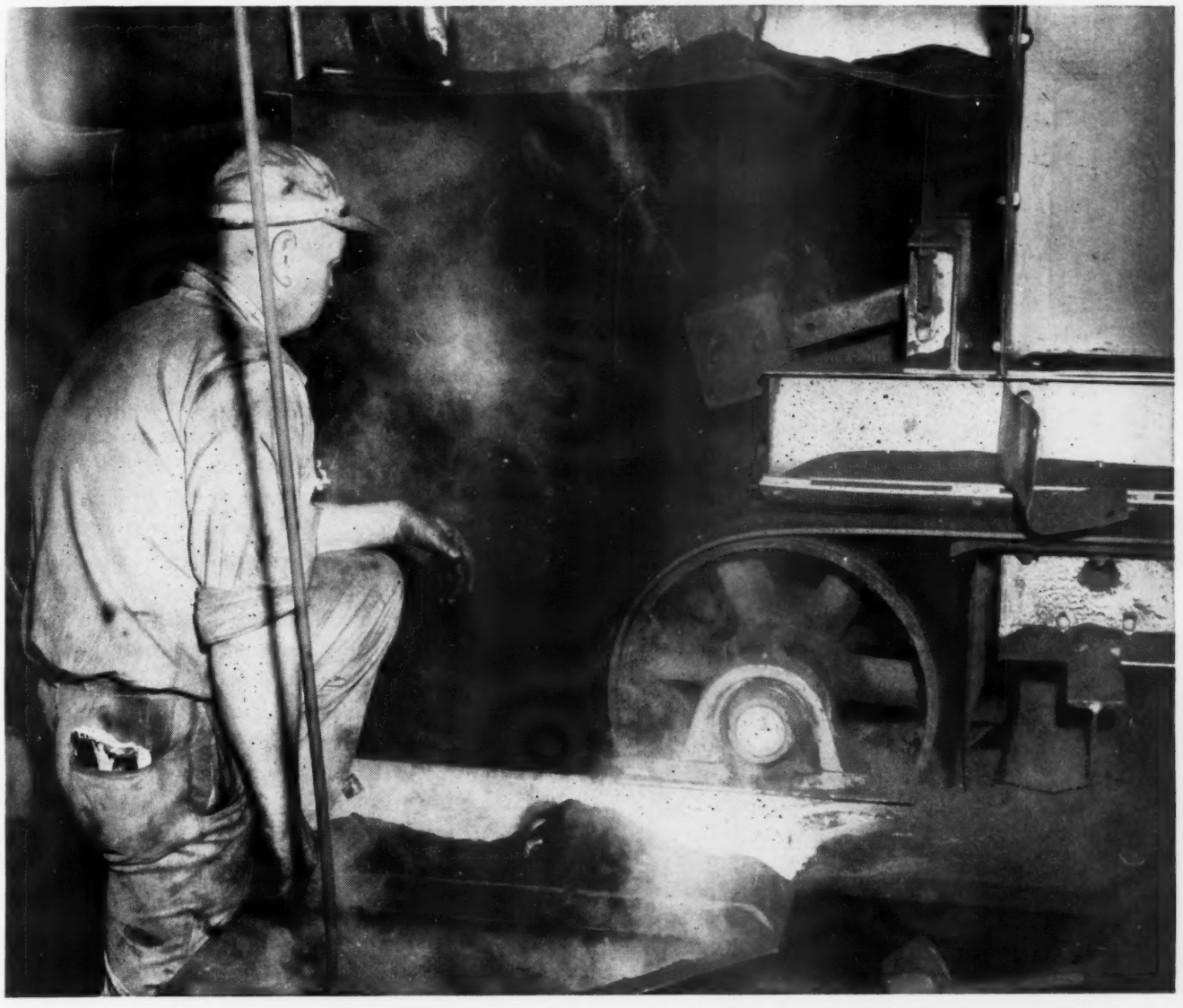
B.F.Goodrich



Foundry reports B. F. Goodrich belt cuts clean-up time 90%

IT used to take a man an hour or two a day to clean up the mess around that conveyor belt. Sizzling hot sand, from casting molds, is dumped on the belt and carried to storage.

A woven asbestos belt was used, but it had to have "first aid" every three weeks—a sticky dressing to protect it from the 300 degree heat. Then the steaming sand would cling to the belt cover. Some would build up on the return idlers, a great deal dropped on the floor. Clean-up time was costing the company $900 a year.

Then a B. F. Goodrich man told them his company had developed a special heat-resisting rubber for belts carrying such things as hot sand, lime, nitrates. Instead of ordinary fabric, B. F. Goodrich uses *glass* fabric to make a belt that can stand extreme heat.

The foundry installed this B. F. Goodrich belt. It runs 8 hours a day, 5 days a week, handles 75 tons an hour. Since it needs no liquid dressing, there's no sticking, no spillage. Clean-up time has been cut to once every 3 weeks.

Making a belt that stands terrific heat is typical of B. F. Goodrich product improvement. Other BFG improvements have resulted in Grommet V belts that last 20 to 50% longer, air hose that lasts for years in heat, oil, hard knocks—and hundreds of other products that last longer, serve better. You can get these cost-saving benefits through B. F. Goodrich distributors. Or write *B. F. Goodrich Industrial Products Company, Dept. M-674, Akron 18, Ohio.*

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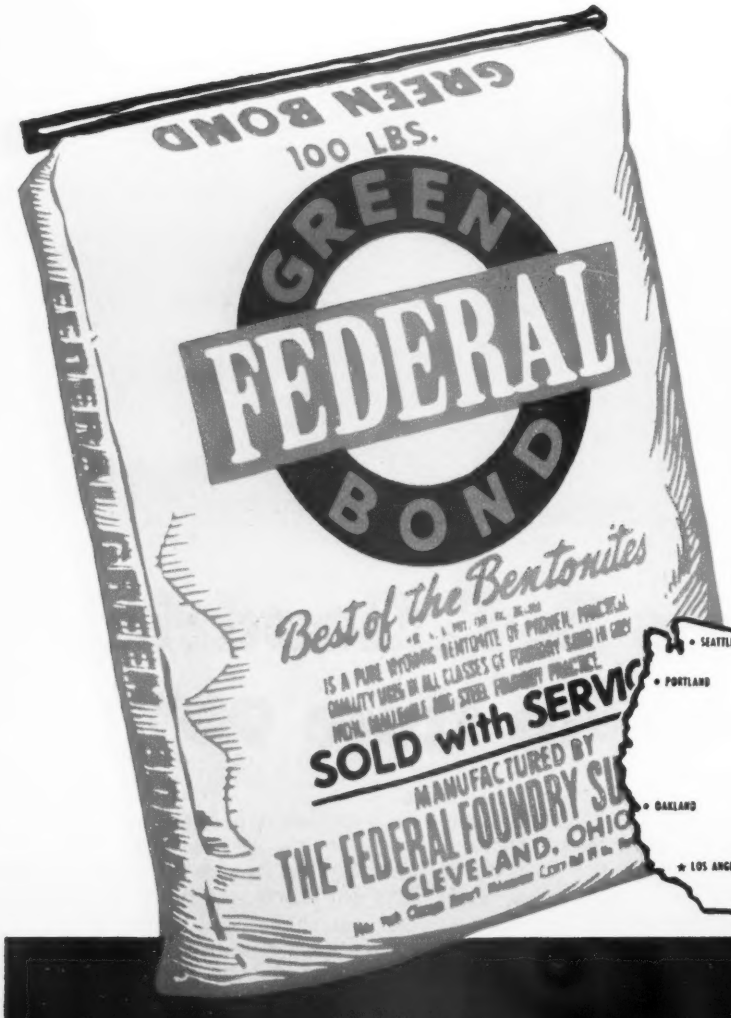
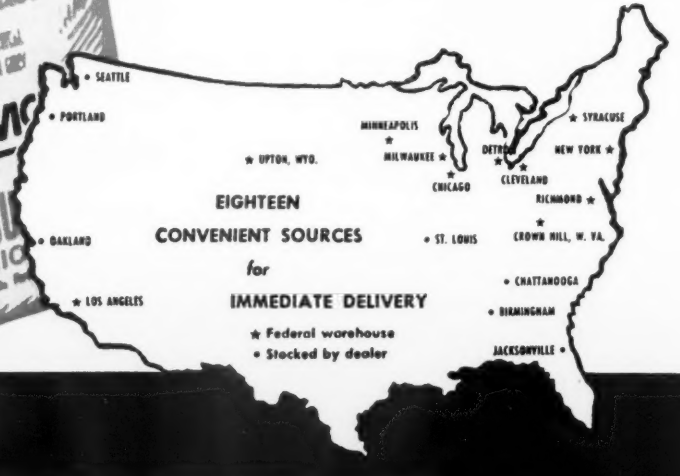
Low viscosity is a *natural characteristic* of the bentonite clay from which FEDERAL GREEN BOND is produced — *not* a property acquired through adding certain chemicals. FEDERAL engineers "test-drill" bentonite deposits *before* mining — select only those lots with a *natural low viscosity* for production of FEDERAL GREEN BOND.

FEDERAL GREEN BOND is a pure mineral product—*unadulterated, untreated.* It contains no chemicals or other ingredients detrimental to foundry sands or conditions. Its low viscosity, its ability to develop and control HIGH green and dry bond strength, its exceptionally high Ph rating (9.0) and its unerring uniformity are inherent qualities that just "come naturally" in FEDERAL GREEN BOND.

Therefore, if you want to use a bentonite that *just naturally* lets you temper your sand with lower moisture content, develop optimum strength and *save mulling time*—change to FEDERAL GREEN BOND. If you use bentonite in slurry form and want to add up to *25% more bentonite per gallon of water* for a more potent slurry, thus enabling you to provide better control of moisture content and sand strength — change to FEDERAL GREEN BOND, the best of the bentonites.

FEDERAL GREEN BOND is available in either pulverized, granular or the *quick dispersing* slurry grade—at 18 convenient distribution centers throughout the U.S.A. (see map below). Also available throughout Continental Europe.





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THE FEDERAL FOUNDRY SUPPLY CO.

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FOUNDRY
A PENTON PUBLICATION

July 1956
Volume 84—Number 7

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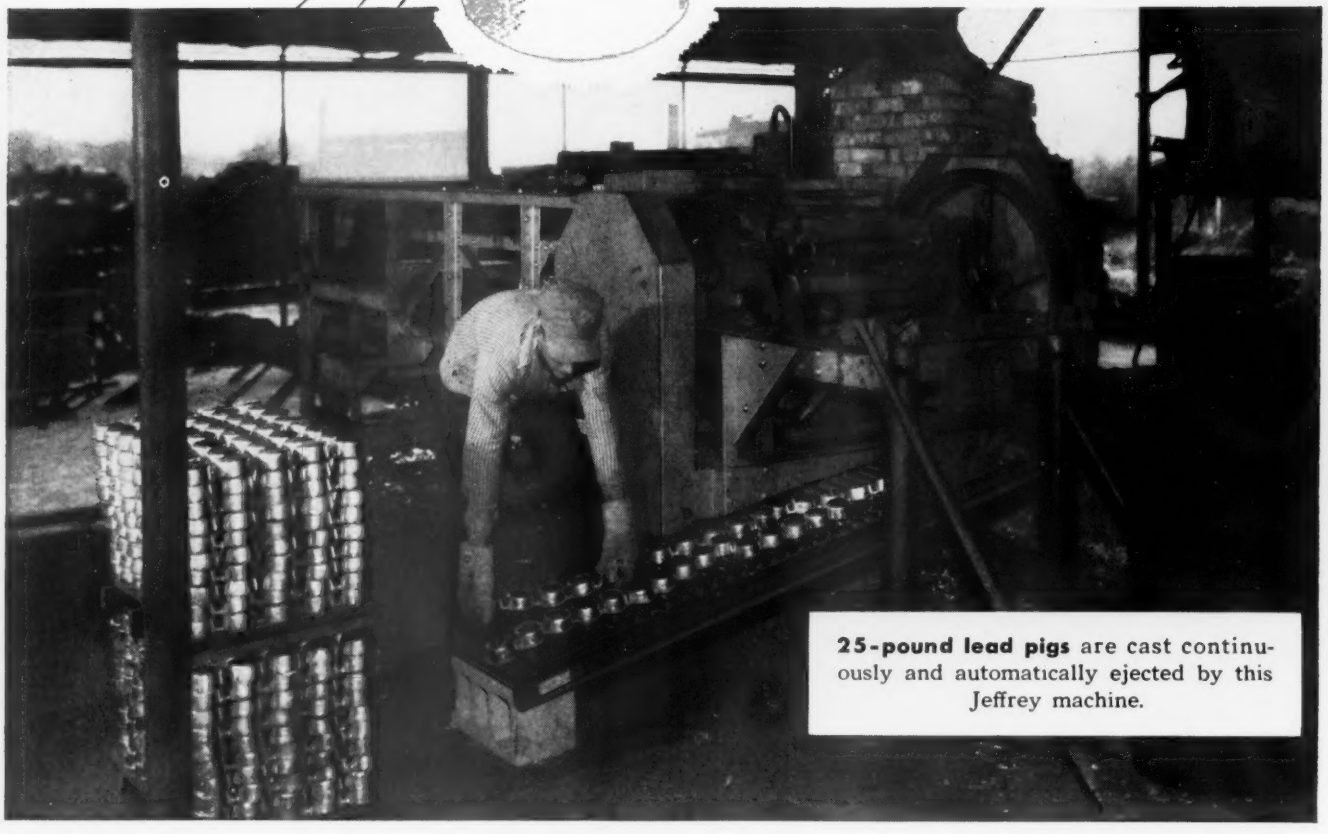

25-pound lead pigs are cast continuously and automatically ejected by this Jeffrey machine.

Jeffrey pig casting machines put this operation on a straight line basis, automatically emptying the molds after the metal has solidified. Production proceeds at a constant, rapid rate requiring a minimum of labor.

Aluminum, magnesium, lead and brass are among the metals being cast in Jeffrey pig casting machines. Designed to meet each company's exact requirements, they assure that this operation is most profitable.

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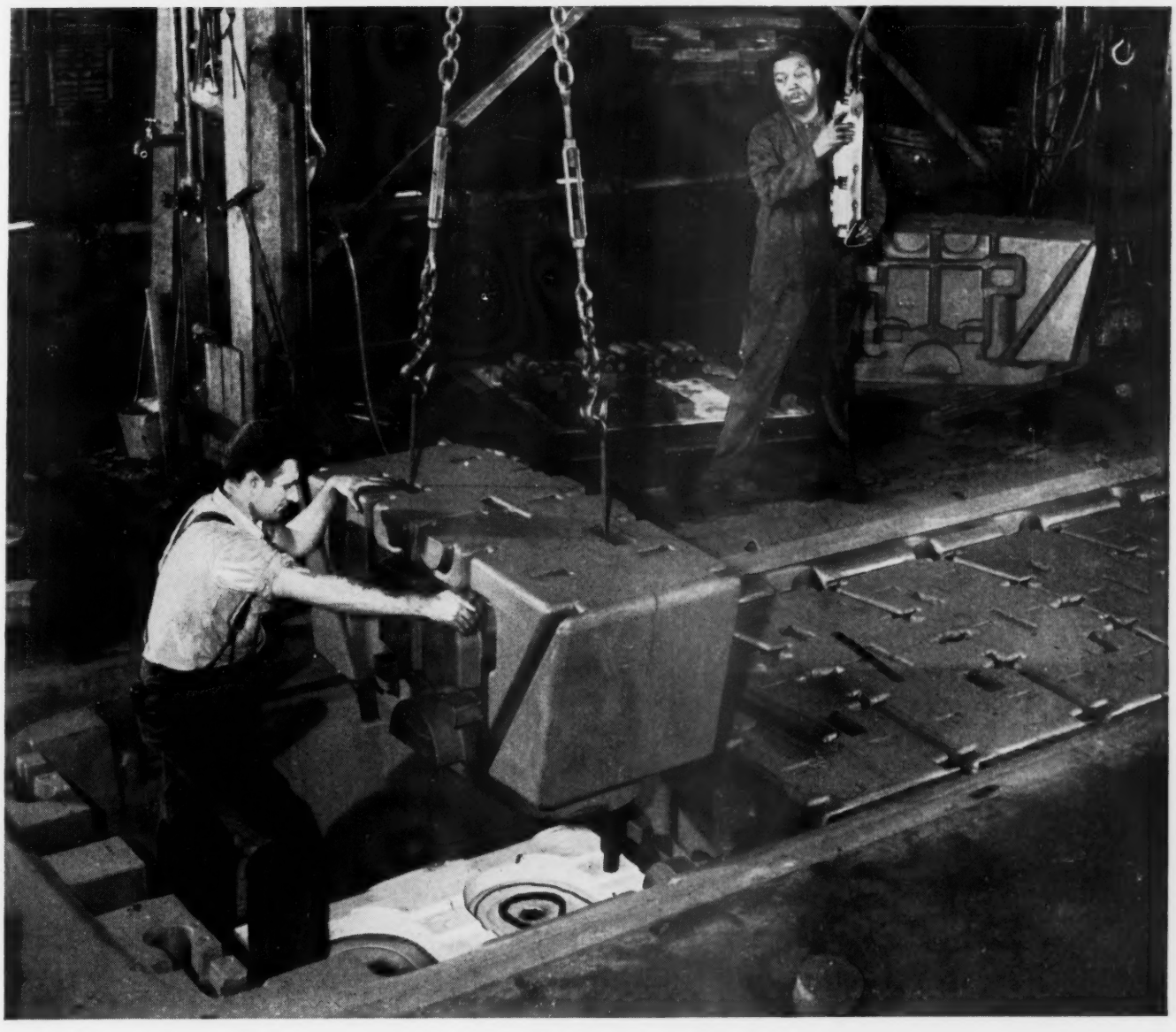

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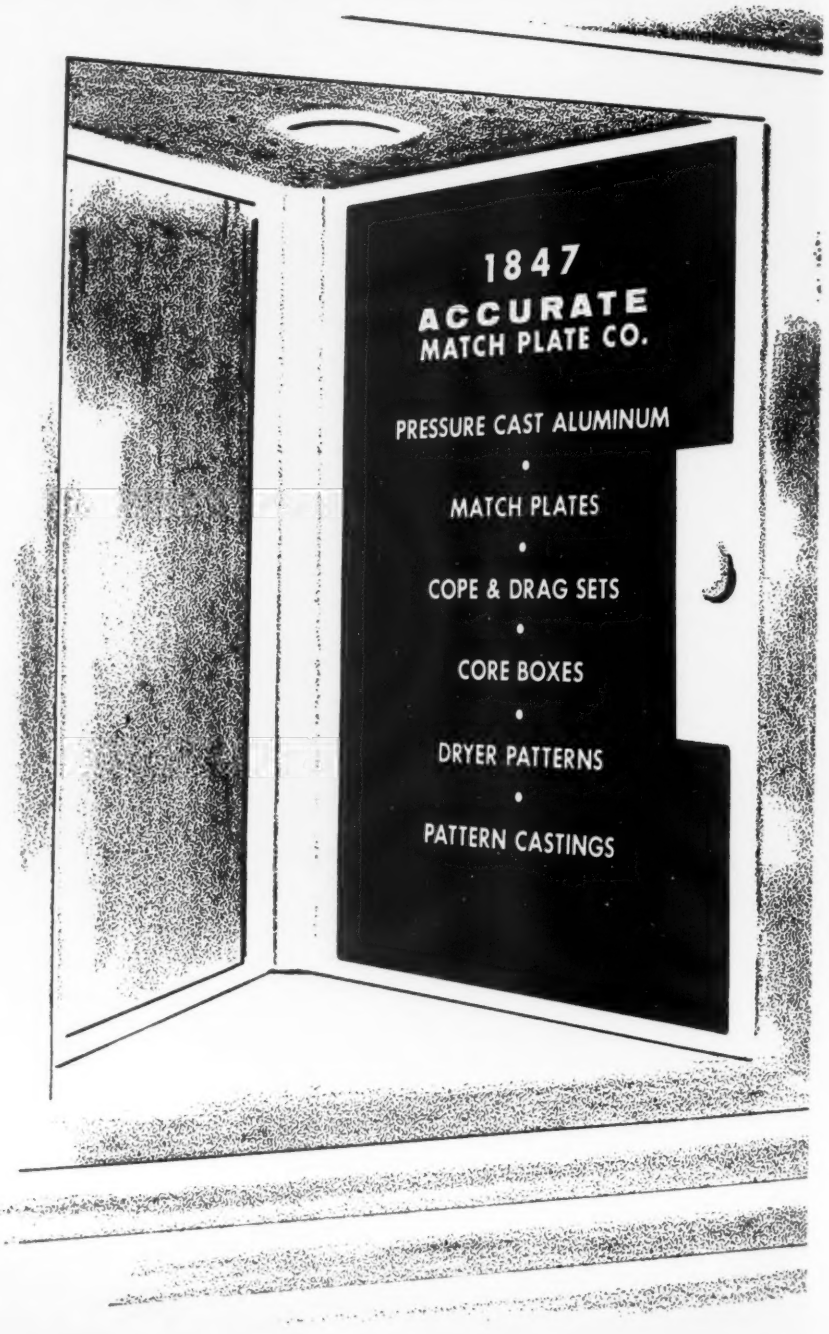

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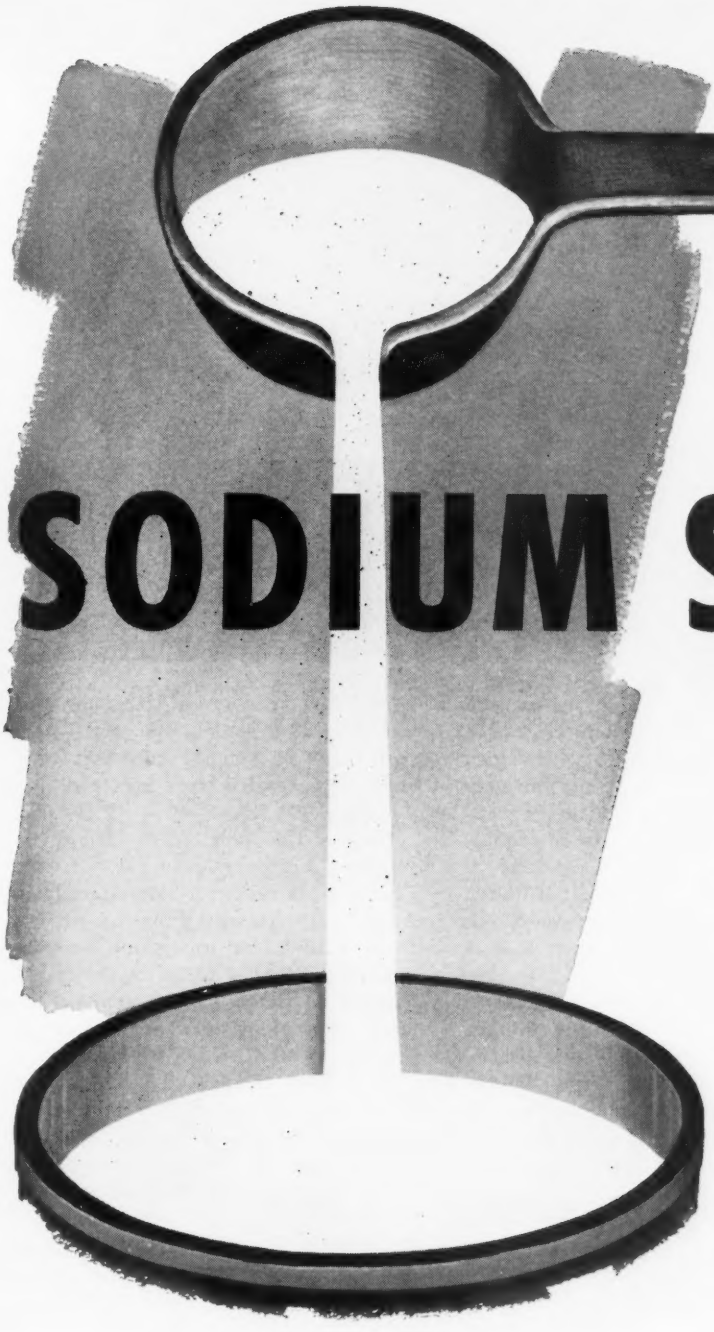

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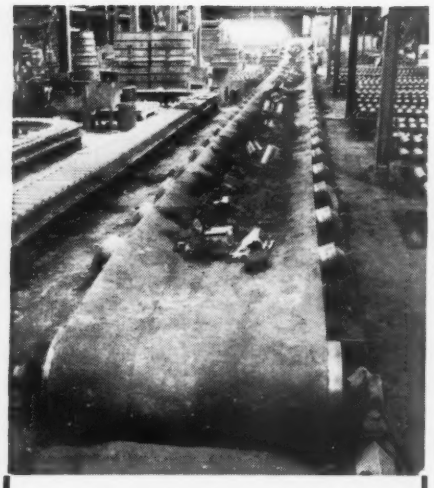

Imperial Belt gives 26 times expected life

Durability proven in destructive foundry service

Operators of the Riverside Foundry counted on only a month's service from belting used on the new conveyor pictured above.

They figured the destructive action of heat (300°-600° F.) from carrying "cherry-red" castings and hot sand, plus abrasion and gouging, would ruin any belt quickly.

However, the original belt, Imperial Super Insulated Sahara Armored (205′ x 42″ x 6 ply) was still in operation after 26 months at the last report.

Super-strong construction

Such outstanding service records are not unusual for Imperial INNERLOCKED* Belting. The base fabric, heavy-duty hard silver duck, has a tensile strength of over 750 lbs. per inch of width. INNERLOCKED* stitches prevent ply separation.

Exclusive Imperial impregnating compounds waterproof, lubricate, toughen and preserve the duck fabric. Metallic reinforcement gives Sahara Armored Belting maximum resistance to abrasion and impact.

Job-designed

Imperial Sahara Belts are job-designed to withstand temperatures to 600° F. Whatever your needs, Imperial Belting will give you lowest long-time operating costs. Write for Data Sheet 54-2 which describes the Imperial Belts for foundry service.

*INNERLOCKED—*Reg. trade name of Imperial Belting Co.*

You expect more from Imperial . . . and you get more!

Imperial BELTING CO.

1755 S. Kilbourn Ave., Chicago 23, Ill.

Circle 561 on Inquiry Card

With the Editors

CONTEST WINNER: One of the interesting contests conducted at the recent AFS Atlantic City Foundry Show consisted of guessing the correct number of tons of foundry sand handled by various parts of equipment manufactured by Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago. A note from I. H. Dennen, advertising manager of B & P, reports that the correct tonnages of sand handled by the various parts were as follows: M Alloy slinger liner, 1583 tons; M Alloy slinger tip, 784 tons; Speedmullor liner, 487,320 tons; Speedmullor borium-coated plow, 23,860 tons. All parts had been removed from the machines before they were fully worn.

The 6-ft scale model convertible shown in the above illustration was won by Forest W. Hanson, superintendent, Mohawk Foundries, Cleveland. His answer of 509,500 tons was just 4047 tons short of the correct total of 513,547 tons of sand. Over 4000 entries were received.

—o—

Display Emblem: C. R. Heller, executive secretary-treasurer of the Foundry Equipment Manufacturers Association, Washington, mentions that members of the group proudly displayed the FEMA membership placard in their booths at the Atlantic City show, as may be seen in the illustration below.

This view, incidentally, also shows FEMA Vice President Gordon Seavoy (right) vice president of Whiting Corp., Harvey, Ill., explaining a model of an electric furnace to J. W. Nuss, foundry engineer, American Radiator & Standard Sanitary Corp. Another model, showing a complete foundry, also was on display at the

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for die casting, shell molding and permanent molding

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• Check your present melting costs. If they are high, they may be losing business for you. Let us make recommendations for Hausfeld Furnaces to meet your requirements, and cut your costs. Write for Bulletin 103 on crucible aluminum furnaces, or literature on any non-ferrous melting job. THE CAMPBELL-HAUSFELD CO., 300-320 Moore Street, Harrison, Ohio.

Hausfeld

METAL MELTING FURNACES

Circle 563 on Inquiry Card

Material Handling Exposition in Cleveland the first week in June, then was taken to Michigan State University, East Lansing, Mich., for the education seminar staged there in cooperation with the AFS.

—o—

Congressional Record: The May 21 issue of the "Congressional Record," page 7722, contains the following statement by Congressman Charles A. Vanik of Ohio: "I want to take this opportunity to call the attention of the Members of Congress to an article which appears in the April issue of a trade magazine entitled Foundry in which Editor Frank G. Steinebach sets forth a guide for Congress." The editorial from the April issue follows.

Thanks, Congressman Vanik, for calling our protest on the scrap export policy and the industry's suggestion for a reasonable and constructive program to the attention of the members of Congress.

—o—

Up the Columbia: Some years ago, when my Mother and Dad visited Portland, they reported in glowing terms on a trip up the Columbia River. Therefore, when I planned the visit to the West Coast AFS

chapters in April, I wrote Fred Menzel, manager of the Portland plant of Rich Mfg. Co., and the new chairman of the Oregon Chapter, that I also would like to make that trip. The result was one of the highlights of the entire West Coast trip.

Fred met me at the airport, and after lunch, we took the scenic route which really is the old road. We saw Bonneville Dam, got a thrill out of salmon on the way to spawn climbing the man-made ladder at the dam, and we returned on the new highway along the river. It was a most enjoyable afternoon.

Bill Hughes, Electric Steel Foundry, Portland, and photographer for the chapter, took the above photo of Fred and me just before the Oregon chapter meeting started.

F.G.S.

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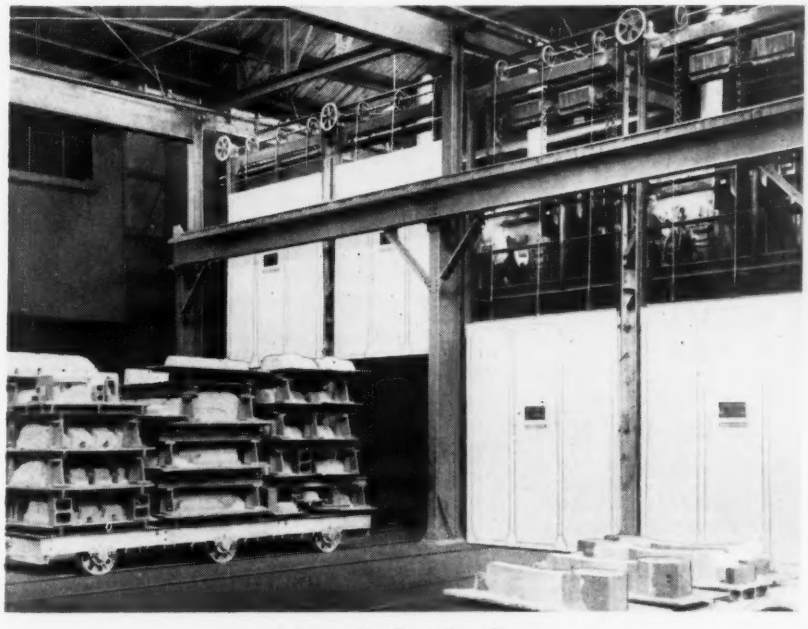
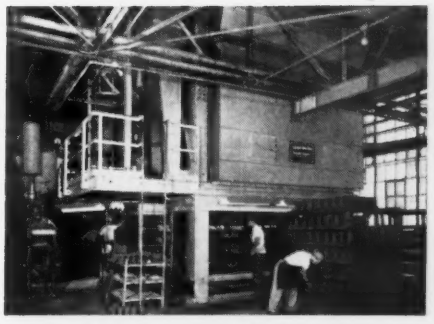


Coleman Car-Type Core Ovens



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2 Qt. Oil Capacity

5 pipe sizes from ½" to 1½" incl. Permanent, metal oil reservoir. Series 408.

2 Gal. Oil Capacity

5 pipe sizes from ¼" to 1" incl. Replaceable, metal oil reservoir. Reversible. Series X400 and X402. 2 pipe sizes — 1¼" and 1½". Replaceable, metal oil reservoir. Series X406.

5 Gal. Oil Capacity

5 pipe sizes from ¼" to 1" incl. Replaceable, metal oil reservoir. Reversible. Series Y400 and Y402. 2 pipe sizes 1¼" and 1½". Replaceable, metal oil reservoir. Series Y408.

C.A. Norgren CO.

3451 So. Elati St., Englewood, Colo.

Without obligation, learn how Norgren Lubricators can reduce costs in your plant —call your nearby Norgren Representative listed in your telephone directory, or **WRITE THE FACTORY FOR NEW No. 700 CATALOG.**

Pioneer and Leader in Oil-Fog Lubrication Since 1930

Circle 565 on Inquiry Card

Calendar of MEETINGS

July 17-30—Materials Handling Training Conference, Lake Placid, N. Y.

Sept. 1-9—Association of German Foundrymen, International foundry exhibition and trade fair, Dusseldorf, Germany.

Sept. 9-12—National Metal Trades Association, eastern plant management conference, Essex-Sussex Hotel, Spring Lake, N. J.

Sept. 11-13—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 16-21—American Chemical Society, annual meeting, Convention Hall, Atlantic City, N. J.

Sept. 16-22—American Society for Testing Materials, Pacific area national meeting and apparatus exhibit, Hotel Statler, Los Angeles.

Sept. 17-21—Instrument Society of America, instrument-automation conference and exhibit, Coliseum Bldg., New York.

Sept. 24-25—Steel Founders' Society of America, annual fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Sept. 24-26—Material Handling Institute, fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Sept. 25-28—Association of Iron and Steel Engineers, iron and steel exposition, Public Auditorium, Cleveland.

Sept. 27-29—National Association of Foremen, annual meeting, Jefferson Hotel, St. Louis.

Oct. 4-5—Magnesium Association, annual meeting, Drake Hotel, Chicago.

Oct. 8-12—American Welding Society, fall technical meeting, Hotel Cleveland, Cleveland.

Oct. 8-12—American Society for Metals, national metals congress and exposition, Public Auditorium, Cleveland.

Oct. 11-12—Armour Research Foundation, national noise abatement symposium, Hotel Sherman, Chicago.

Oct. 11-12—National Foundry Association, annual meeting, Sheraton-Cadillac Hotel, Detroit.

Oct. 18-20—Foundry Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 22-26—National Safety Council, safety congress and exposition, Conrad Hilton, Congress, Morrison and La Salle Hotels, Chicago.

Oct. 25-26—Metals Casting Conference, Purdue University, Lafayette, Ind.

Oct. 20-23—Conveyor Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 29-30—Refractories Institute, fall meeting, The Homestead, Hot Springs, Va.

Oct. 30-Nov. 2—Gray Iron Founders' Society, annual meeting, The Homestead, Hot Springs, Va.

Oct. 31-Nov. 1-2—Industrial Management Society, time and motion study and management clinic, Hotel Sherman, Chicago.

Nov. 8-9—All-Canadian Foundry Conference, sponsored by Eastern Canada, Ontario and British Columbia chapters of AFS, Sheraton-Mount Royal Hotel, Montreal.

Nov. 25-30—American Society of Mechanical Engineers, annual meeting, Hotel Statler, New York.

Nov. 26-30—Third International Automation Exposition, New York Trade Show Bldg., New York.

Nov. 29-30—Michigan Regional Foundry Conference, Union Bldg., University of Michigan Ann Arbor, Mich.

Dec. 5-7—American Institute of Mining and Metallurgical Engineers, electric furnace steel conference, Morrison Hotel, Chicago.

1957

Feb. 4-8—Gray Iron Founders' Society, committee week and spring meeting, Benjamin Franklin Hotel, Philadelphia.

Mar. 25-29—American Society for Metals, Western Metals Congress and Exposition, Ambassador Hotel and Pan-Pacific Auditorium, Los Angeles.

Automatic MONORAIL

Delivers 25 Tons Daily

One man uses push-button control to load, automatically dispatch, over four tracks, and dump fresh core sand at any of 24 stations.

This flexible American Monorail System is tied in with manually operated track switches. Stations may be increased to 16 per track.

This American Monorail installation is typical of hundreds which have sharply cut handling costs.

Today call your nearby American Monorail Representative or write us.

Member of Materials Handling Institute • MonoRail Association

AMERICAN OVERHEAD HANDLING EQUIPMENT

MONORAIL COMPANY

13104 ATHENS AVENUE
CLEVELAND 7, OHIO

[IN CANADA—CANADIAN MONORAIL CO., LTD., GALT, ONT.]

Circle 566 on Inquiry Card

YOU'LL DO A BETTER JOB

with H. V. ADAMS DESIGNED

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

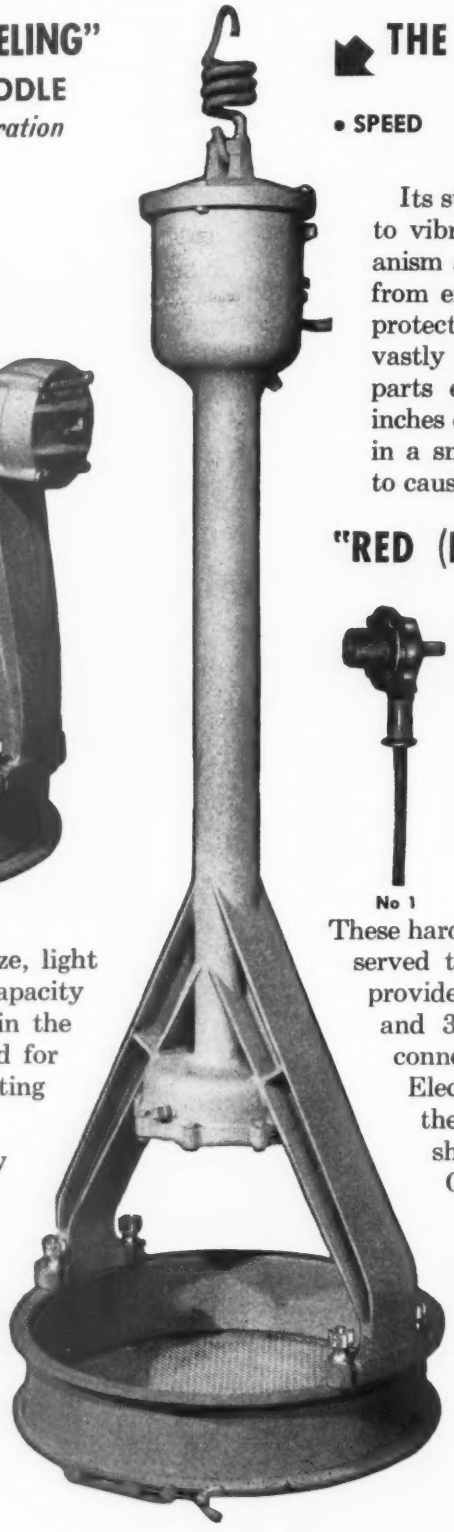
with the Double Eight Vibration

Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.



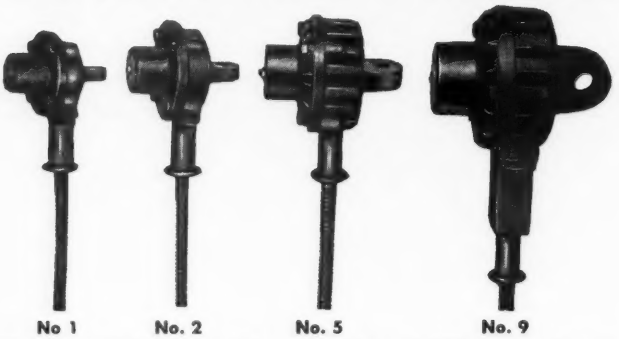
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

- SPEED
- ECONOMY
- SAFETY
- LONGER LIFE
- GREATER SIFTING CAPACITY

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area—are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

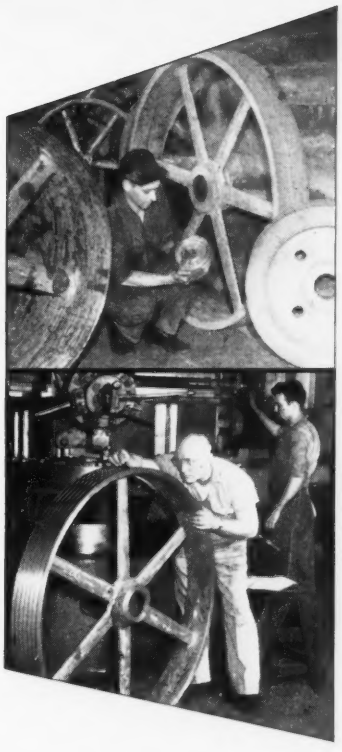
- No. 11 NOISELESS TYPE VIBRATOR
- A-20 ELECTRIC VIBRATOR
- RED ELECTRIC KNEE SWITCHES
- "ROTO" ADJUSTABLE BIN VIBRATOR
- 2 MIN. UNIVERSAL FINENESS TEST SIFTER.
- UNIVERSAL TRIPOD CARRIER

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

Established 1918 Cable Address: "Rotoplane Chicago" H. V. ADAMS, Mgr.



PLASTI-BOND

the only way to combine toughness, flowability, strength and low moisture in a fine sand

High pressure molding demanded properties in a fine green sand which were not available with the known additives. In developing *Plasti-Bond,* these demands were met—the result was "precision" castings in green sand. But *Plasti-Bond* is not confined to high pressure molding. The same properties find applications in every casting requiring improved finish, improved precision or weight control, extended versatility, fast economical cleaning and absence of casting defects.

The unusual properties of green sand with *Plasti-Bond* in high pressure molding enhance the production of small "precision" castings and improve the entire range up to the heaviest castings produced in green sand.

HOW ELSE COULD YOU—

1. Obtain high flowability in sands with green strength from 12 to 20 psi?
2. Obtain high flowability combined with toughness in excess of 200?
3. Operate 120 A.G.F. sand with 2% moisture or less?
4. Get deep lifts with tough sand with moisture less than 2%?
5. Get hard-ramming and high mold hardness without danger of scabs and blows?
6. Pour brass, bronze, aluminum, gray iron and malleable in the same sand and get smoother castings on all of them?
7. Be able to change from a "tough" sand to a "silky" sand at will, or from batch to batch without changing the type of additive or the base sand?

In addition to improved finish, cleaning and dimensional control on a wide variety of castings, *Plasti-Bond* sand can be used as a "super-finish" additive.

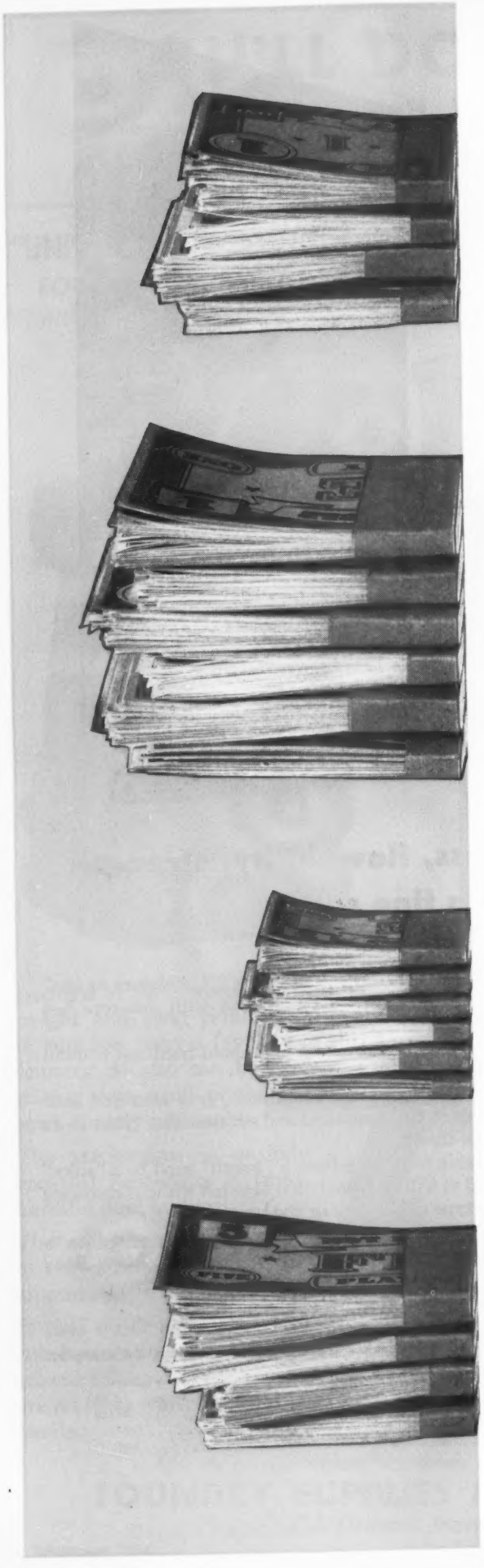
✓ ***Imagine what you could produce in this facing for example:***

83%..	135 Mesh Sand	Perm	22
7%..	Black Hills Bentonite	Green Strength....	14 psi
10%..	Silica Flour	Dry Strength.....	57 psi
1%..	Plasti-Bond	Deformation	.014
3.0%..	Moisture	Toughness	196
		Rowell Flowability.....	79

EASTERN CLAY products dept. International Minerals & Chemical

INTERNATIONAL MINERALS & CHEMICAL CORPORATION, 20 North Wacker Drive, Chicago 6

DIXIE BOND • BLACK HILLS BENTONITE • REVIVO BOND • PLASTI-BOND • REVIVO CORE PASTE • CUPOLINOR • CUPOLINE • TACCONE MOLDING MACHINES



Want to really cut costs in your cleaning room?

switch to

CINCINNATI PD Snagging Wheels

TAKE A TIP from the ever increasing number of foundries all across America, and switch to CINCINNATI (PD)° SNAGGING WHEELS—the greatest grinding wheel development in years.
CINCINNATI (PD) WHEELS will absolutely cut costs in your cleaning room . . . saving you money four important ways:

- LONGER WHEEL LIFE—Through longer life of CINCINNATI (PD) WHEELS, users have reported almost *double* the production per wheel. One customer, using a portable grinder, gets almost *twice* the life with a CINCINNATI (PD) Flared Cup. Another user, snagging cylinder blocks on a swing frame, has increased the production per wheel 45% with (PD) WHEELS.
- FREER CUTTING—You can get more pounds of metal per hour with the grains and bonds specified by CINCINNATI for your jobs. Operators like the fast, easy cutting action of CINCINNATI (PD) WHEELS.
- SELF-DRESSING ACTION—The CINCINNATI (PD) WHEELS specified for your job by CINCINNATI abrasive engineers require few, if any, dressings. With the right grade of wheel, new cutting grits are bared as soon as old grits get dull and inefficient.
- POSITIVE DUPLICATION (PD)—"On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike, assuring you continued cost reduction.

CINCINNATI (PD) WHEELS are made in vitrified and resinoid bonds for both ferrous and non-ferrous foundries and are available in a complete variety of sizes and shapes.

Yet these better, cost-cutting CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

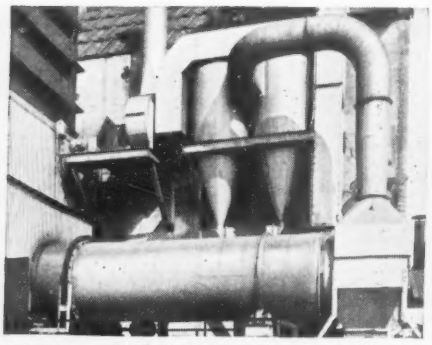
We'll be happy to prove to you how CINCINNATI (PD) WHEELS can increase your production and cut costs and time in your cleaning room. Just contact us and we'll send one of our representatives. Wire, write or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

° Trade Mark Reg. U. S. Pat. Off.

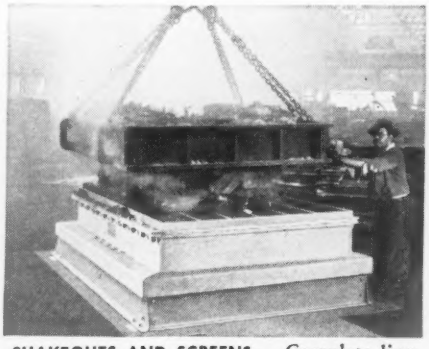
CINCINNATI°
Grinding Wheels

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

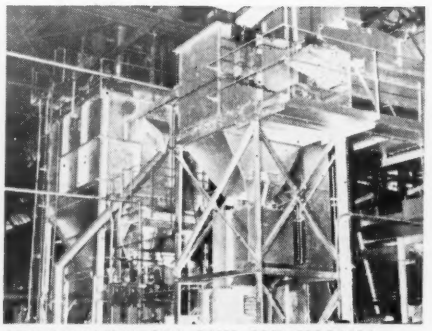
For handling sand and castings--



DRYERS — Link-Belt Roto-Louvre uniformly dries and cools large tonnages of sand. Floor space is conserved because no extra cooler is required.

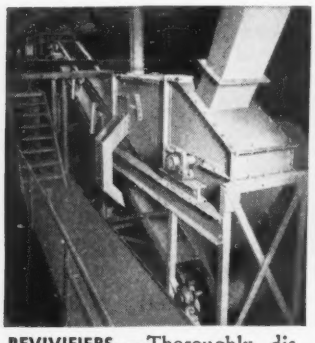


SHAKEOUTS AND SCREENS — Complete line provides centralized separation of sand and castings or sand screening for every type and size foundry.

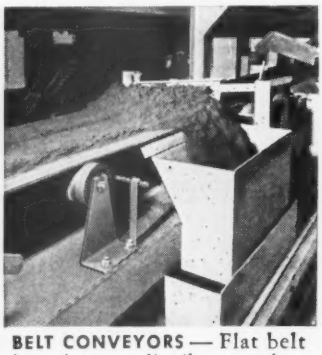


BUCKET ELEVATORS, BINS AND HOPPERS — Low-cost elevating and storage of sand. Sturdily built in a wide range of types and sizes.

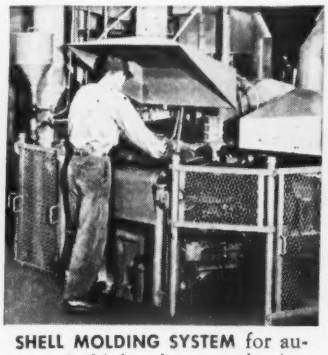
LINK-BELT quality equipment...



REVIVIFIERS — Thoroughly disintegrate, blend, cool molding sand so it will ram to uniform density. Also remove shot.



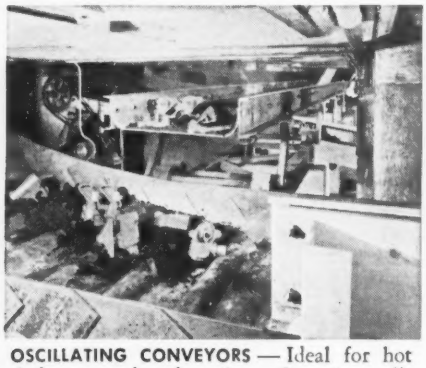
BELT CONVEYORS — Flat belt has plows to distribute sand to molders' hoppers. Troughed type used for other sand handling.



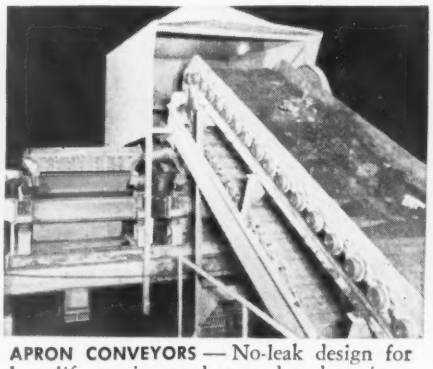
SHELL MOLDING SYSTEM for automatic, high-volume production of precision castings requiring little or no machining.

MOLD CONVEYORS — A full line of car, pallet, roller and trolley types meets all variations of foundry practice.

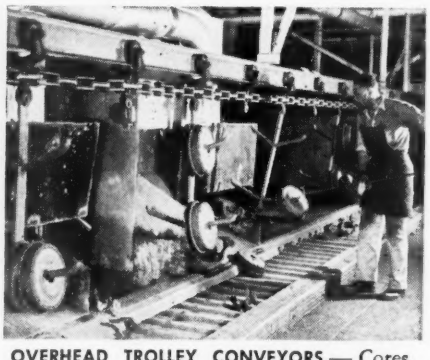
cuts your costs every step of the way



OSCILLATING CONVEYORS — Ideal for hot shakeout sand and castings. One-piece, all-metal trough eliminates wear, leakage. With screened trough section, acts as shakeout.



APRON CONVEYORS — No-leak design for long-life service on hot sand and castings. Operates in horizontal or steeply inclined paths. Also good as sorting conveyor.



OVERHEAD TROLLEY CONVEYORS — Cores, molds and castings are economically handled. Complete flexibility of path and capacity provided plus saving of floor space.

Ask your nearest Link-Belt office for new Book 2423. It shows Link-Belt's complete line of modern equipment for ferrous and non-ferrous foundries plus 7 tested layouts.

LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13.907

DELTA
DRI-BOND BINDER

DEVELOPS

1. HIGHER TENSILE AND COMPRESSION STRENGTH...

2. GREATER WATERPROOFING PROPERTIES . . .

3. HIGHER GREEN STRENGTH AND HOT STRENGTH

IN CORE SAND

THAN ANY OTHER DRY BINDER TESTED

DELTA DRI-BOND BINDER is a product of several years of research and experimentation in our own sand research laboratory and proved by additional years of actual experience-in-use data compiled by prominent foundries. The excellent results obtained with Delta Dri-Bond Binder, reported by all sources, establish beyond question both the outstanding superiority and greater economy of this new product for use in steel, gray iron and non-ferrous foundries.

Cores made with Delta Dri-Bond Binder have excellent resistance to metal erosion, completely resist veining and metal penetration and shake out readily from the finished castings.

Get the Facts . . . Working samples and complete literature on Delta Dri-Bond Binder will be sent to you on request for test purposes in your own foundry.

DELTA

DELTA OIL PRODUCTS CO.

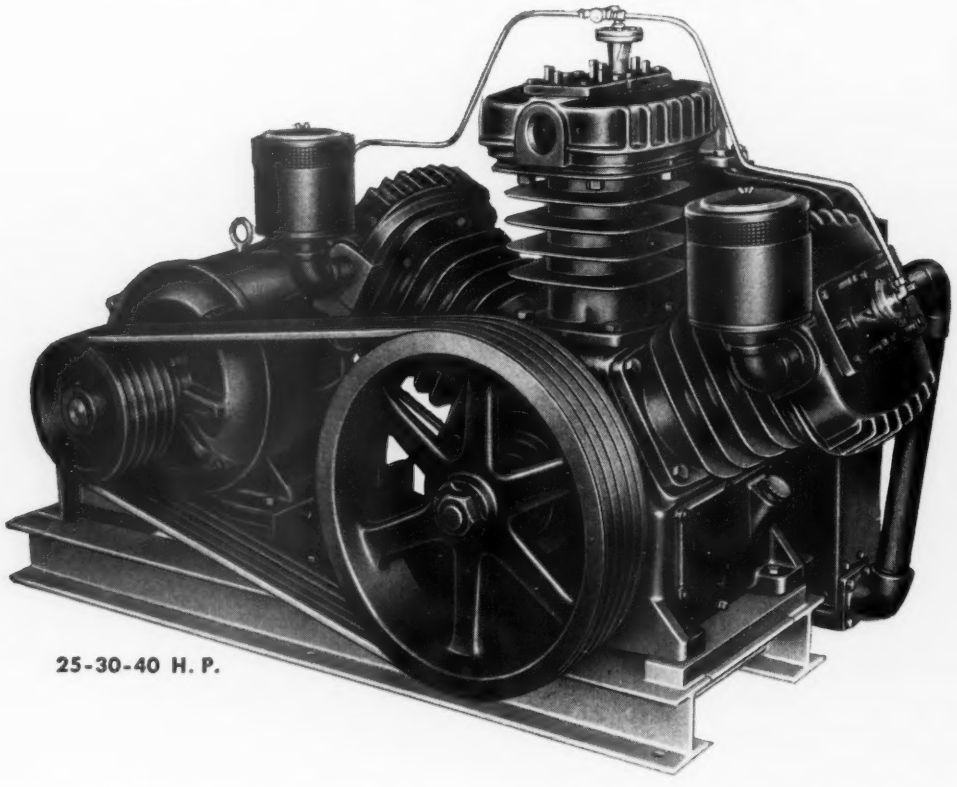
MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

Circle 571 on Inquiry Card

THE NEW CURTIS MODEL C-100
TWO-STAGE, AIR-COOLED AIR COMPRESSOR

Provides Higher Operating Efficiency Costs Less to Install



25-30-40 H. P.

THIS NEW Curtis Two-Stage will deliver more air per minute, per horsepower and per kilowatt hour of electrical energy consumed, thus assuring a saving in your electrical bill.

It's Air Cooled, thereby eliminating expensive water bills and assuring quick and easy installation with no complicated plumbing problems.

The new C-100 embodies all the well-known Curtis engineering features such as centro-ring oiling and Timken Main Bearings.

For complete information write for illustrated folder.

Remember, you can count on... OUR 102nd YEAR

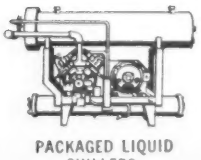
Curtis

MANUFACTURING COMPANY • PNEUMATIC DIVISION

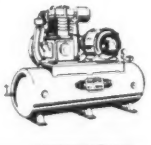
1922 KIENLEN AVE. • ST. LOUIS 20, MO.

CM-6

AIR HOISTS
AIR CYLINDERS



PACKAGED LIQUID CHILLERS



AUTOMOTIVE AIR COMPRESSORS

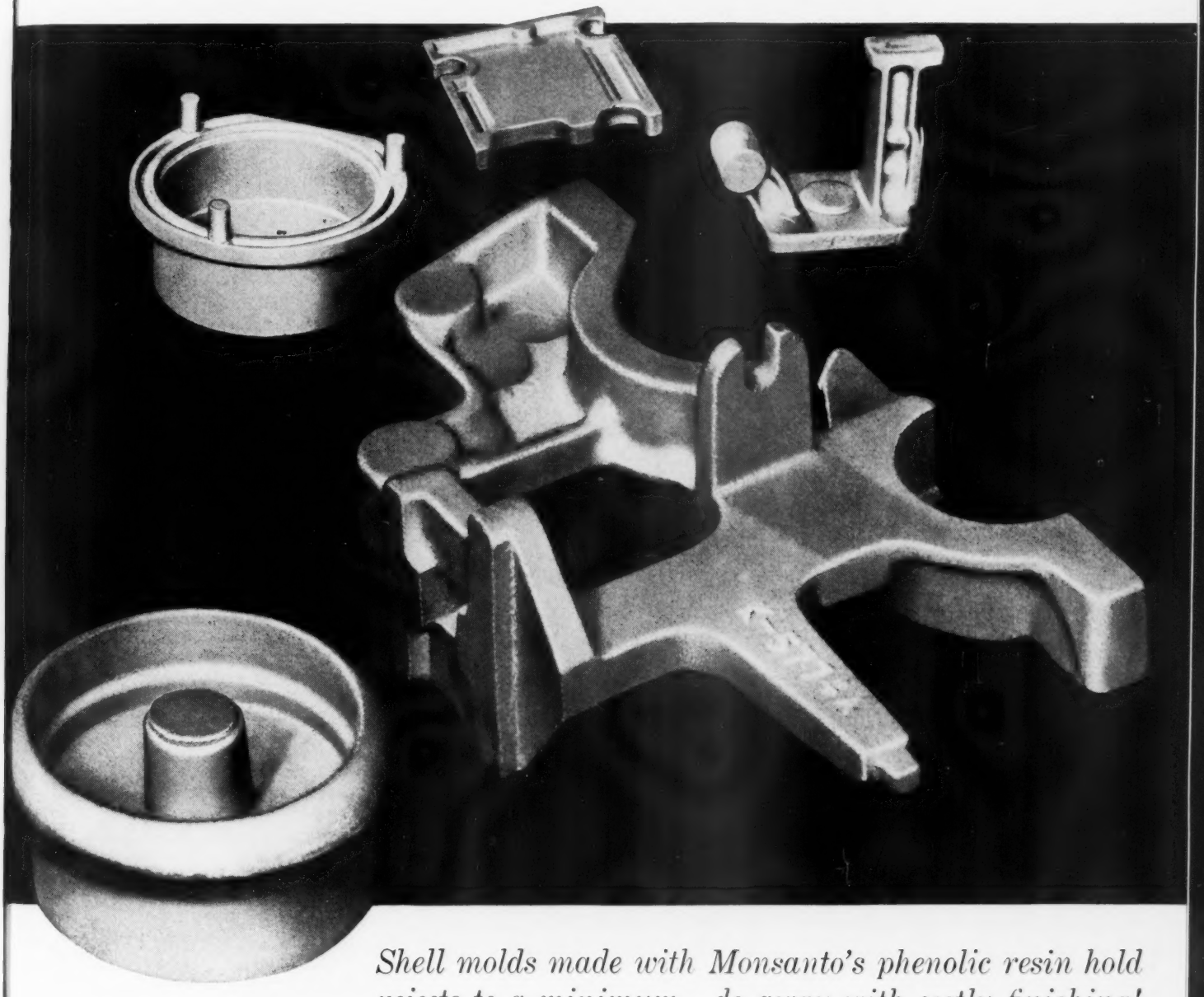
AUTO LIFTS

PACKAGED AND REMOTE AIR CONDITIONING

Circle 572 on Inquiry Card

Facing Page—ITEM 573→

For smoother shell molds with outstanding hot strength— rely on **RESINOX*** **736**



Shell molds made with Monsanto's phenolic resin hold rejects to a minimum—do away with costly finishing!

In foundry after foundry, Resinox 736 is speeding up production cycles and drastically reducing costs.

This unique phenolic resin is specially formulated by Monsanto to fit latest shell molding techniques. On a low sand-to-resin ratio Resinox makes molds with outstanding density and strength.

Its hot strength is sufficient to produce intricate castings weighing as much as 15 or 20 pounds—under certain conditions up to 50 pounds. Dimensional tolerances are excellent.

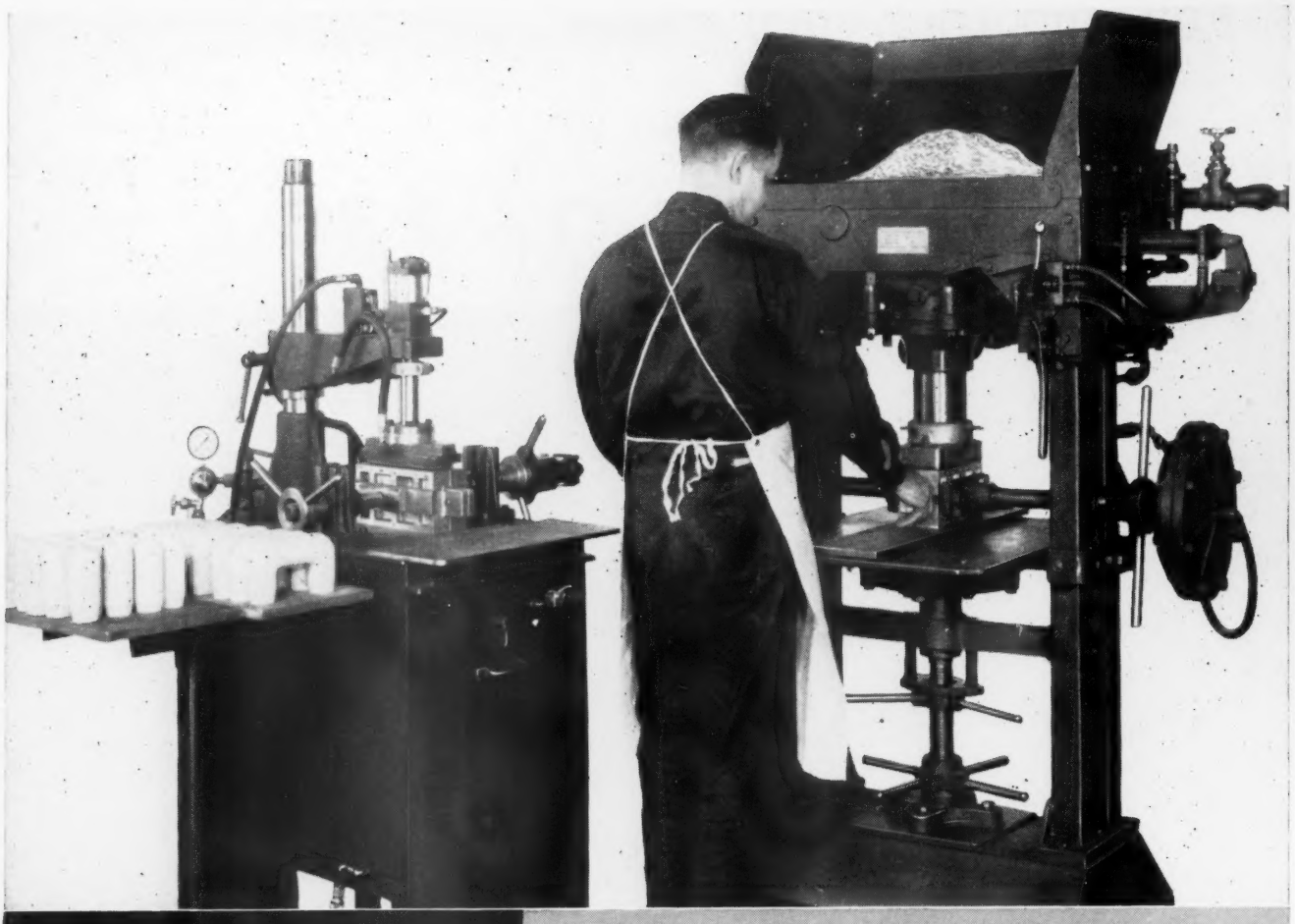
On many jobs no finishing is required. Edges are clean and sharp. Detail is remarkable. Rejects are minimized.

Resinox 736 is suitable for most shell molding applications. Other Resinox formulations are also available to meet special problems.

For shell molding, core binding or sand conditioning resins that are research-developed and shop-tested to meet your foundry needs, write first to Monsanto Chemical Company, Plastics Division, Dept. 450, Springfield 2, Massachusetts.

*Resinox: Reg. U. S. Pat. Off.

MONSANTO



Redford

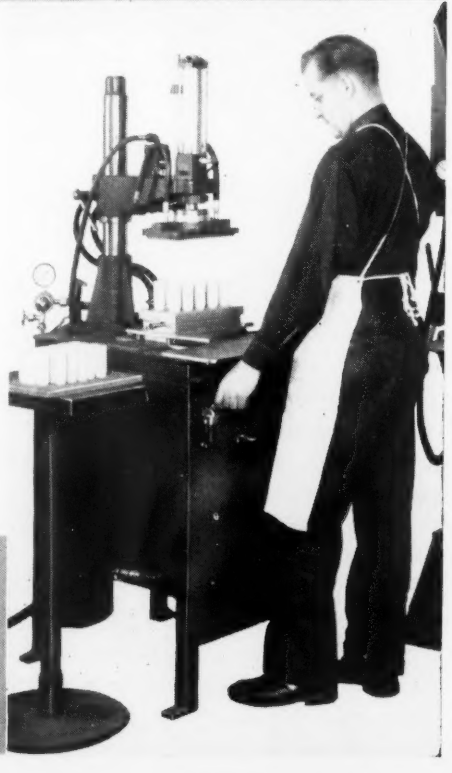
NO. 4 CORE BLOWER with AUTOMATIC CO_2 CORE HARDENING STATION

The *right tools* to assure uninterrupted production if you make cores by the CO_2 Process.

One core box is being blown while another one is automatically clamped, the cores hardened in the core box and the core box released ready to remove finished cores. If core boxes are suitable, cores can be mechanically stripped as shown in the picture at the right.

The Core Hardening Station is completely air operated. Automatic time cycle is quickly adjusted to meet job requirements.

Whether you blow cores with conventional sand mixtures or use the new CO_2 Process, REDFORD equipment gives you the *best* in over-all performance.



Redford IRON & EQUIPMENT CO.
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

Circle 574 on Inquiry Card

Facing Page—ITEM 575→

Your home is made with BRICK . . . *no matter what you build it of!*

Your home—from roof to cellar—and everything in it: the windows to look from . . . the lights to read by . . . the rugs to walk on . . . the chairs to sit in—even the work-saving appliances in your kitchen and the clothes in your closet. Everything that's made . . . everything that moves owes its very existence to refractories.

You see, refractory brick carries the load within industry. But, beyond industry, everyone comes in direct contact with refractories in daily living. The making of refractory products is the most basically necessary industry—with the exception of agriculture—there is.

To provide the right refractory industry needs—castables, plastics, ramming mixes, firebrick, mortars, insulating brick and insulation—General Refractories operates the world's largest refractories research laboratory . . . constantly seeking perfection . . . drawing resources from all over the globe.

A Complete Refractories Service

GENERAL REFRACTORIES COMPANY
Philadelphia 2

A COMPLETE REFRACTORIES SERVICE FOR THE FOUNDRY INDUSTRY

BRIKRAM 80, a high alumina ramming mix, is giving outstanding service in many foundry furnace applications.

BRIKRAM 80 when rammed in place behind rigid forms, forms an excellent refractory lining wherein temperature and resistance to strong flux or slags are desired. BRIKRAM 80 is used to construct the lower side walls and bottoms of aluminum melting and holding furnaces, center sections of electric furnace roofs and side walls and bottoms of malleable iron furnaces.

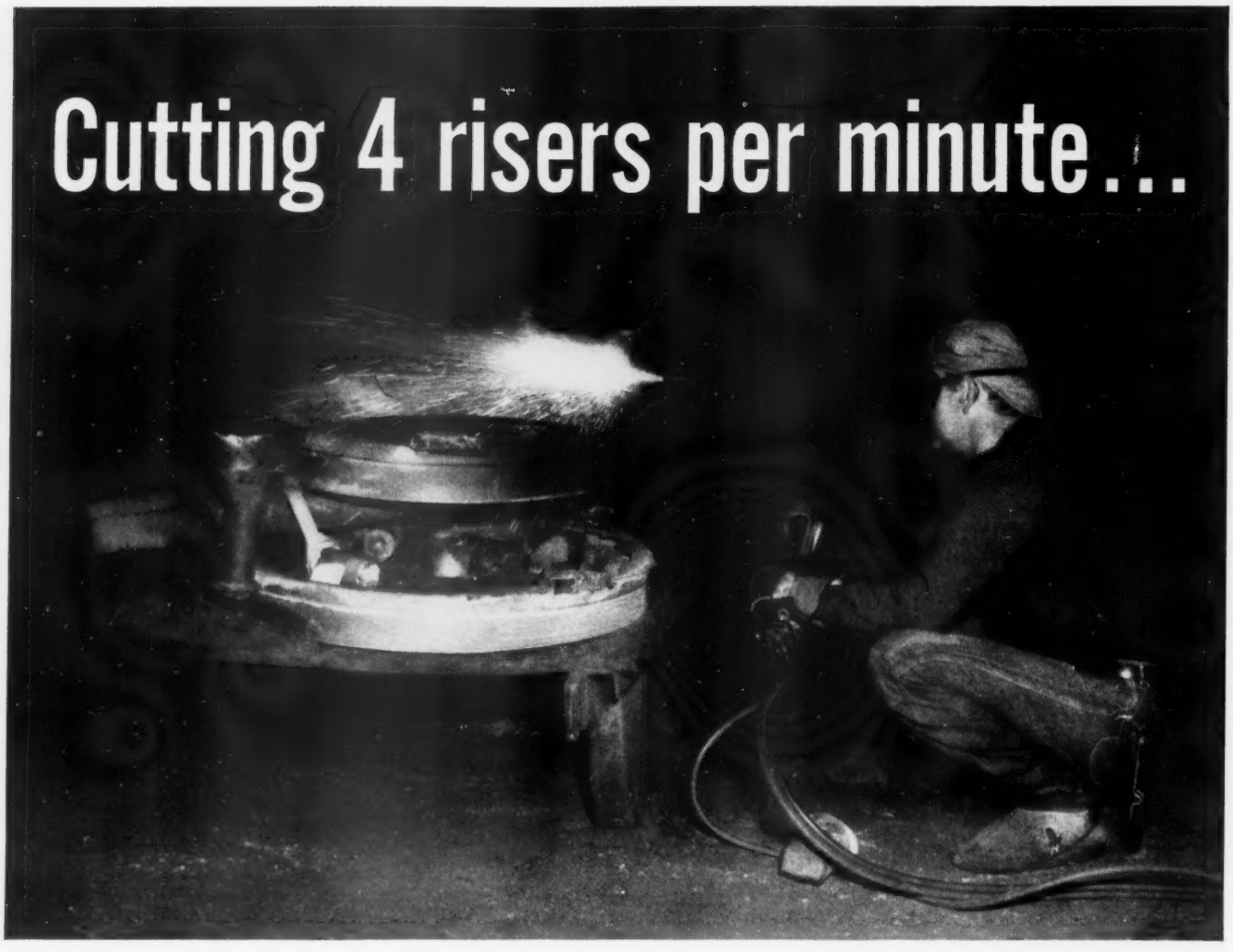
BRIKRAM 80, because of its high alumina content, is recommended for use in desulphurizing units where soda ash and other potent fluxes are used. Ladle life can also be increased by using BRIKRAM 80 in the places where the severe wear occurs. In case of ladles holding high temperature stainless steel, or other metals, long service is given by BRIKRAM 80.

For abrasion conditions, HIGH STRENGTH BRIKRAM 80 is available. This material takes a very hard air set and maintains it up to the softening point of the material.

Consult your local GREFCO representative for more complete details of these, and other GREFCO, products.

GENERAL REFRACTORIES

Cutting 4 risers per minute...



Lightweight and easy to handle, this OXWELD powder-cutting blowpipe makes fast work of risers.

Powder-Cutting speeds removal operations 300%

Removing risers from stainless steel castings need no longer be costly and time consuming. Pictured above is a typical powder-cutting operation at the Ohio Steel Foundry Company, Springfield, Ohio. Here, 2 by 4 inch thick stainless steel risers are removed by powder-cutting in only 15 seconds. By methods previously used, this operation took up to four times longer.

In the powder-cutting process metal powder is automatically injected into an oxygen flame to increase the flame's heat and severing action speed. The powder process is helping users gain new efficiency and speed in the removal of gates and risers, sand incrustations, and casting defects.

The powder-cutting blowpipe used in this operation, an OXWELD AC-4, is designed for hand cutting of oxidation resistant metals such as stainless steel, chrome alloys, and cast iron. Heavier apparatus is also available for manual and mechanized operations.

Increase your production and profit—call your local LINDE representative, or write for illustrated literature on LINDE's modern processes. Start saving now, do it today.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

Linde Trade-Mark

"Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

Hot weather tip . . .

MEXADIP®

does not ferment!

- **MEXADIP WILL NOT FERMENT.** You will not have to dump your wash because of hot humid conditions—no pock marks or pitted coating surfaces with MEXADIP.
- **MEXADIP STAYS IN SUSPENSION.** Let it stand over the week end, it will be ready to go Monday morning.
- **MEXADIP WILL NOT RUN, BUILD UP OR RUB OFF.** It applies equally well on either green or baked cores.
- **MEXADIP IS DEPENDABLE AT ANY BAUME.** It is applied daily to cores for thousands of tons of castings over a range of 10-40 degrees Baume.
- **MEXADIP REQUIRES NO LONG "PASTE" MIXING.** No waiting period is necessary. Just add the powder to water and after a few minutes of stirring it is ready to go.

IMPROVE CASTING APPEARANCE AND SAVE MAN HOURS IN THE CLEANING ROOM. If you have a problem with core wash, MEXADIP will solve it. Ask us to arrange a test today.

Write for free illustrated Engineering Bulletin No. 17 giving complete information about the complete line of United States Graphite Core and Mold Washes.

MEXADIP®

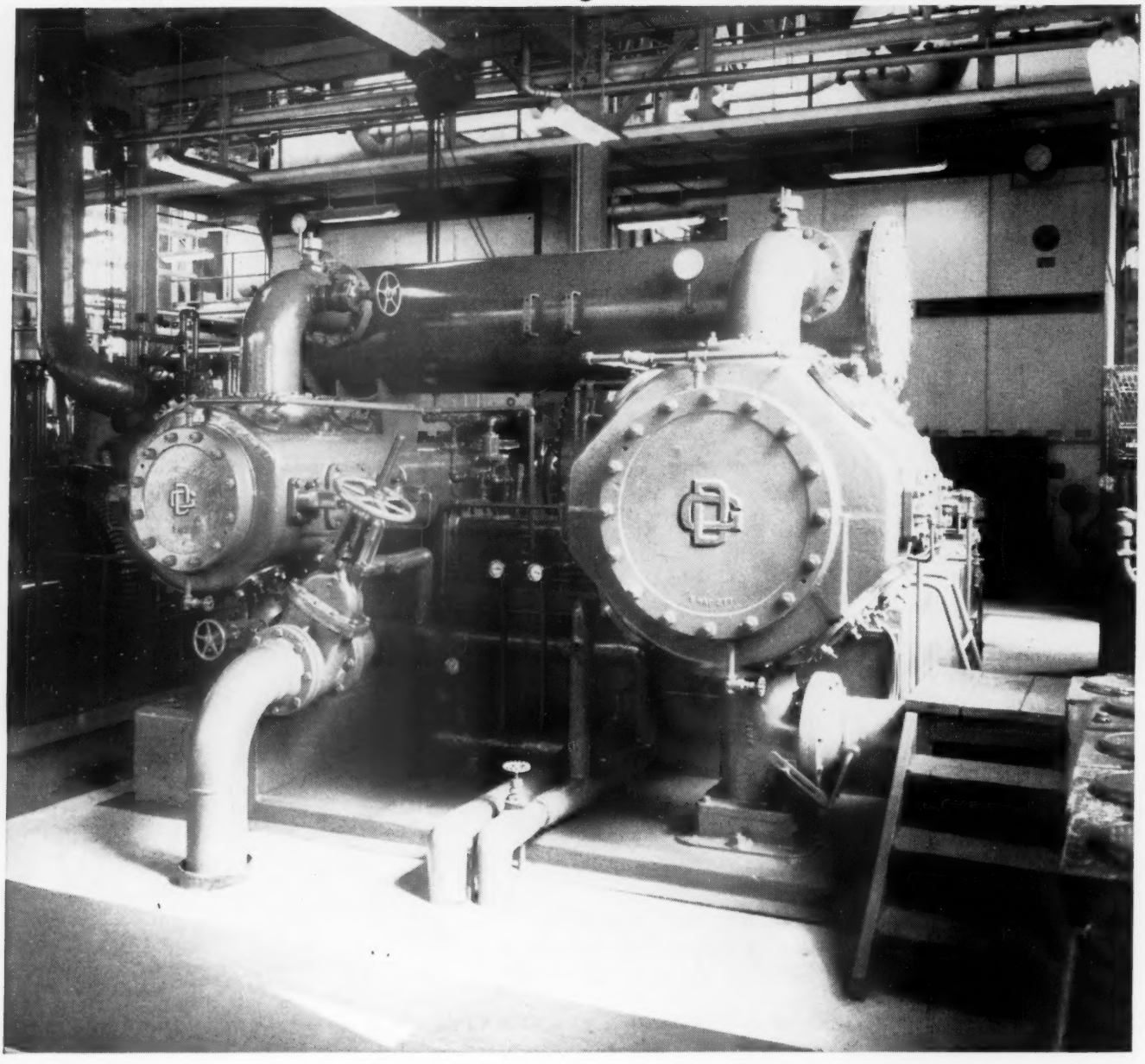
207

OUR 101ST YEAR

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

Gardner-Denver . . . Serving the World's Basic Industries



Model HA-530 to 2010 c.f.m. displacement.

Gardner-Denver Compressors . . . add up to a better investment

Investment dollars go far in a Gardner-Denver HA Compressor. Records of a southern foundry and manufacturing plant disclose an 8-year maintenance cost of $10.00—that's only $1.25 a year!

Add to this the fact that Gardner-Denver Compressors deliver plant air at unusually low cost figures—thanks to such outstanding features as correct air cylinder design and low-lift "air cushioned" valves. Yes, dollar-for-dollar you can't beat a Gardner-Denver Compressor.

JUST OFF THE PRESS: new Bulletin HAC-36 describing Gardner-Denver Horizontal Compressors. Your copy is ready, and will be mailed on request.

GARDNER - DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Specially processed to save you time and money

Norton mounted wheels and points bring "TOUCH of GOLD" economy to hundreds of small snagging jobs

Besides top quality materials and craftsmanship that go into all Norton products, Norton mounted wheels and points have their own built-in extras that make them unequalled performers in small or hard-to-reach areas.

SPECIAL MOUNTING. Norton-developed mounting techniques assure exceptional holding strength that keeps wheels TIGHT on their spindles, even under toughest snagging conditions.

SPECIAL TRUING. Norton's method of truing mounted wheels and points on their own spindles results in: (1) perfect concentricity; (2) exceptional sharpness and fast-cutting action; (3) highest accuracy of dimensions and shape. They're ready to go to work immediately.

In addition, statistical quality control provides the highest standards of duplication from lot to lot, assuring you the same dependable performance each time you re-order.

For Every Purpose

Norton mounted wheels and points are a 100% complete line, made in nearly 200 shapes and sizes, for grinding all metals. You can get them in ALUNDUM* or CRYSTOLON* abrasives, in vitrified, resinoid or rubber bonds, and in the laminated, semi-flexible BF type construction, also in resilient rubber bond for fine polishing operations.

Your Nearest Distributor

can give you valuable aid in selecting the mounted wheels and points you need for best results. Or write to the nearest District Office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

W-1719

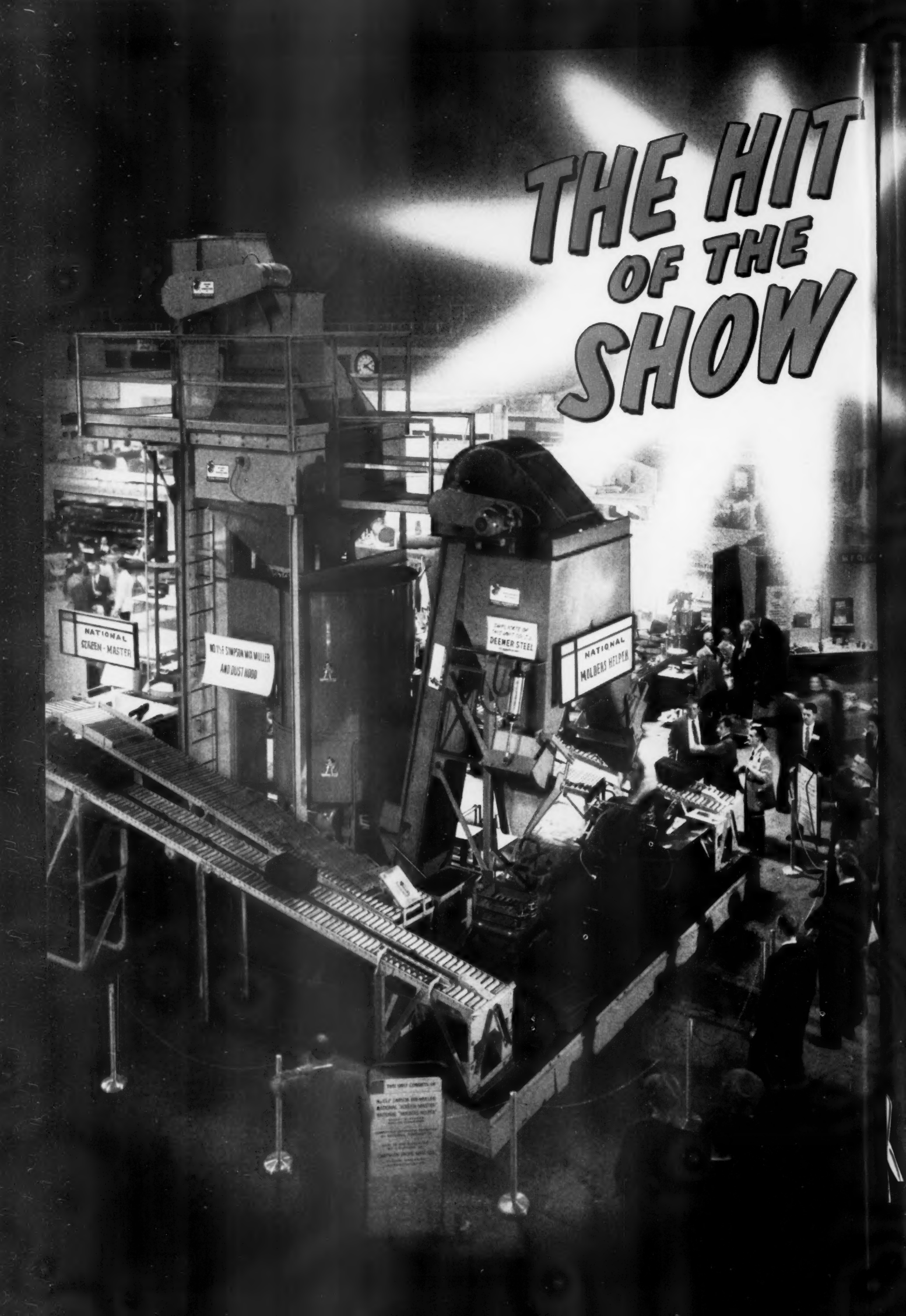
NORTON

ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones Behr-cat Tapes

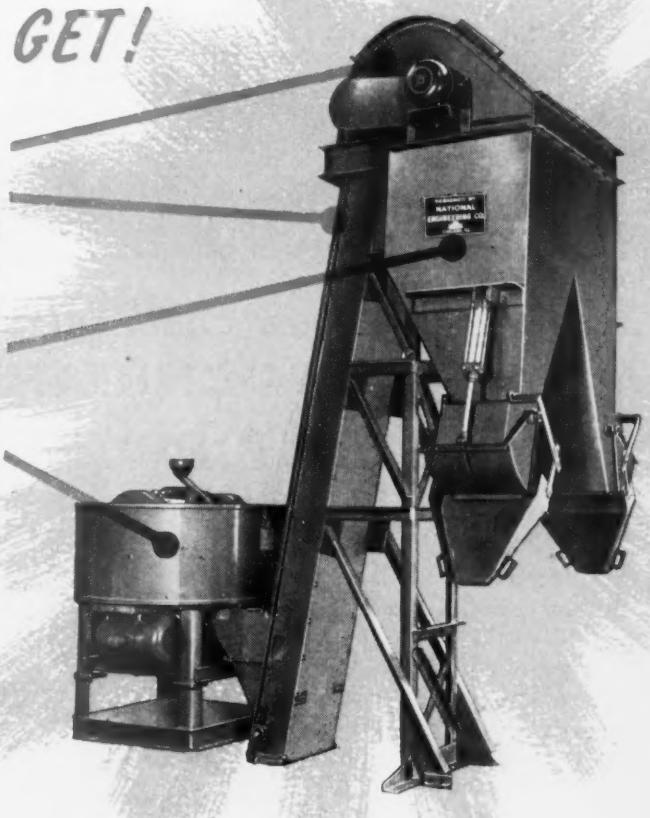

THE HIT OF THE SHOW
NATIONAL SCREEN-MASTER
MOTOR SIMPSON MIX MULLER AND DUST HOOD
DEEMER STEEL
NATIONAL MOLDERS HELPER

NATIONAL MOLDER'S HELPER

You came, you saw . . . and the National Molder's Helper conquered the interest of scores of foundrymen who want to get their sand up off the floor economically, yet efficiently. Yes, the Molder's Helper was the *hit of the show* because it's the logical answer to low cost, overhead sand.

It requires far less area than a floor molding set-up and the savings in manpower alone can amortize its cost in a short time. The unique elevator-aerator combination turned heads at the show. With it, you get a combination of speed and efficiency *unprecedented* in this type of equipment. But what is most important, the Molder's Helper is *within your budget*. Take a look at some of its unique features . . . then ask your man from NATIONAL to tell you how it can save *you* money and time.

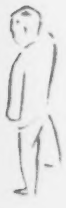
. . . and no wonder LOOK WHAT YOU GET!



IT'S AN ELEVATOR-AERATOR. Unique elevator takes sand directly from discharge of mixer, aerates it, and delivers it free-flowing and lump-free to the Molder's Hopper . . . within 30 seconds!

IT'S OVERHEAD SAND. Costly sand haulage, floor clutter and traffic is eliminated. The Unit, including mixer, occupies far less space than floor mold set-up. One operator can handle all sand preparing needs for up to four molding stations.

USE IT WITH ANY SIMPSON MIX-MULLER . . . including the one you're now operating. The Molder's Helper quickly and efficiently handles the output of any Mix-Muller.



A VARIETY OF STANDARD ARRANGEMENTS are available, including single, double or four molder's hoppers; side or front discharge to molding machines.

WRITE TODAY or call your National Man for full details on the NEW NATIONAL MOLDER'S HELPER.

NATIONAL *Engineering Company*

It's another . . . PRODUCT OF THE PRACTICAL FOUNDRY MAN.

646 Machinery Hall Bldg.
Chicago 6, Illinois

Speeds cycles, cuts bulk handling costs . . .

Only the MICHIGAN 12B gives you a power-shift transmission

Power-shift transmission is standard equipment on the 15 cu. ft. MICHIGAN Model 12B—no engine clutch, no pedal, no gear clash. MICHIGAN is the only Tractor Shovel in this size range with power-shifting. Instead of wrestling with a conventional shift-lever and clutch pedal, the operator simply pushes a single lever on the steering column—like a modern car. High, low or reverse—make any shift instantly, even when travelling.

Entirely new power-train. For the constant stop-and-go, forward-reverse cycles of industrial bulk handling, Clark has designed and built an entirely new power-train for the Model 12B. This exclusive power-train is a completely integrated package, with each component matched to the others:

Torque converter multiplies engine torque up to 300%—provides the extra push to climb grades or penetrate tight material.

Power-shift transmission makes all shifts hydraulically—cuts vital seconds off every cycle.

Planetary-wheel drive axle takes 70% of the torque load off the axle shaft—eliminates broken axles.

Not only does this power-train package make the MICHIGAN faster and easier to operate, it eliminates all the maintenance associated with an engine clutch and pedal. Furthermore, you deal with one single source for design, manufacture and service of all basic components.

Make your own comparison. The MICHIGAN Model 12B is simply more machine than any Tractor Shovel in its class. It is heavier and more powerful; it has low-level bucket action, complete dust protection features, and the exclusive Clark power-train. Before you buy an industrial Tractor Shovel, see this one in action. Write to arrange a demonstration of the MICHIGAN Model 12B on any job you name; clip the coupon to your letterhead and we'll do the rest.

Michigan is a registered trade mark of

CLARK® EQUIPMENT

Arrange demonstration of Model 12B:

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2475 Pipestone Road
Benton Harbor 30, Michigan

Late News

LAST HALF OF 1956: Despite some concern over a midyear slump in business, metalworking executives believe the second half of 1956 will ring up a new record in dollar sales and that the whole year will set a dollar record. That is the consensus of metalworking managers who participated in a survey on what's ahead in business which was conducted by *Steel*, our sister Penton publication, and reported in its June 25 issue. Three out of four of the 1250 participants expect second-half dollar volume to be as good as or better than that of the first half—itself a boom period for most metalworking companies. A large part of the improvement will result from second-half price increases, estimated over-all at 3.5 per cent. These predictions assume general labor peace, however, and a steel strike could alter them drastically. Such a strike looks like a distinct possibility at this writing, but its effect would depend on its duration.

FOUNDRY OUTLOOK: For foundries, the outlook is spotty, but generally good. Suppliers to the auto industry cannot expect an outstanding third quarter, but the fourth should see a sharp upturn. Most types of machinery continue strong, although farm equipment is off 13 per cent from 1955. Construction seems likely to be especially active this summer as it catches up for time lost because of weather conditions, strikes and material shortages. Freight car builders are moving fast: May deliveries hit 6667, for the highest month since October, 1953. Backlogs were 133,072 June 1.

FOUNDRY INJURIES RISE: U. S. Bureau of Labor Statistics figures show that frequency rates for foundry injuries rose in 1955 by from 1.8 to 3.4 work injuries for each million employee-hours worked. Rates for 1954 and 1955, respectively, compare as follows: Gray iron and malleable, 25.9 and 29.3; steel, 17.9 and 20.7; nonferrous, 18.1 and 19.9. These increases compare with a rise for all manufacturing of only 0.2, from 11.9 in 1954 to 12.1 in 1955. The much larger foundry increases are attributed to the substantial expansion in the working force and the longer work week which accompanied higher production in 1955. Both factors normally increase incidence of accidents.

HEADS BDSA DIVISION: Leonard T. Willison, assistant general manager of sales, Jones & Laughlin Steel Corp., Pittsburgh, has been appointed director of the Iron and Steel Division, Business and Defense Services Administration, U. S. Department of Commerce. He will serve actively as director for some six months. Mr. Willison joined Jones & Laughlin in 1927 and has served in various capacities in the industrial engineering, operating, metallurgical and sales departments.

UPS RESIN PRICE: A general price increase of 1½ cents per pound for powdered shell molding resins has been made by the Chemical Division, Borden Co., New York, effective July 1. The price has been 26 cents per truckload pound and 27 cents per pound less than truckload. Rising delivery and production costs are said to have caused the increase.

SCRAP EXPORT CONTROLS: Both the House of Representatives and the Senate have approved extension of the Export Control Act, which provides for control of ferrous scrap export by the Department of Commerce, for two more years, effective June 30, 1956. Both bodies also called for a complete survey of iron and steel scrap available and asked for an interim report in three months and a final one not later than Jan. 31, 1957. The House, however, directed that the survey be made by full-time employees of the Department of Commerce, who were empowered to call on other departments of the government for such information as required, and the Senate directed the Bureau of Mines of the Department of the Interior to make the survey. The Senate did not limit the director of the Bureau of Mines to the use of full-time employees of his or other governmental departments or to the use of outside research organizations of a professional type.

Nonetheless, the Department of the Interior, the Department of Commerce, foundry industry representatives and the semi-integrated steel companies believe the best and most efficient scrap survey can be made by the Department of Commerce. They further feel that the department should not be limited in the use of outside professional research organizations and that studies made in the near future should be checked and rechecked periodically. Foundry representatives are urging the House Banking and Currency Committee to ask for a conference on this bill so that the desired type of survey will be included.

MFS ELECTS: Leon J. Wise, vice president, Chicago Malleable Castings Co., Chicago, was elected president of Malleable Founders' Society at its annual meeting June 10-11 at the Homestead, Hot Springs, Va. Philip C. DeBruyne, vice president, Moline Malleable Iron Co., St. Charles, Ill., was elected society vice president. New directors include Edward T. Price, general manager, Cadillac Malleable Iron Co., Cadillac, Mich.; Stowall C. Wasson, vice president in charge of operations, National Malleable & Steel Castings Co., Cleveland, and Richard W. Crannell, vice president, Lehigh Inc., Easton, Pa. Lowell D. Ryan, formerly managing director of the society, was given the new title of executive vice president.

OBITUARY: Jack Cleary, 66, vice president of sales and service, Sand Products Corp., died June 14 in Cleveland . . . Leo J. Gardner, 43, manufacturers' representative for various foundry supply companies, with headquarters in Cleveland, died June 15 . . . August N. Farmer, treasurer, Sand Products Corp., died June 23 in Cleveland. Mr. Farmer was one of the founders of the company in 1925.

MISCELLANY: Wheland Co., Chattanooga, Tenn., plans to construct a mechanized foundry on property adjacent to its present plant at an estimated cost of $3½ million . . . Alloy Precision Castings Co. has leased a 23,000-sq-ft plant at 3855 West 150th St., Cleveland, to which it will move all its production facilities. Operations there will begin July 15 . . . Aluminum Co. of America has purchased a 57-acre site for a 200,000-sq-ft, $1½ million die casting plant in Edison Township, N. J., which will replace its Garwood, N. J., plant.

Prices of Foundry Metals and Coke

(As of June 25, 1956)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.00-17.00
OVEN	
Birmingham	$25.65
Buffalo	27.50
Chicago	27.00
Detroit	27.50
Erie, Pa.	27.50
Indianapolis	26.75
Kearny, N. J.	26.75
Lone Star, Tex.	19.50
Milwaukee	27.50
Montreal, Que.	28.50
Neville Island (Pittsburgh)	26.25
New England, deld.	28.55
Painesville, O.	27.50
Philadelphia	26.50
St. Louis	28.50
St. Paul	26.50
Swedeland, Pa.	26.50
Terre Haute, Ind.	26.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$62.50	$63.00
Birmingham	55.00	59.00
Buffalo	60.50	61.00
Chicago	60.50	60.50
Cleveland	60.50	60.50
Duluth	60.50	60.50
Erie, Pa.	60.50	60.50
Everett, Mass.	62.50	63.00
Fontana, Calif.	68.00	....
Geneva, Utah	60.50	....
Granite City, Ill.	62.40	62.90
Lone Star, Tex.	55.00	....
Neville Island (Pittsburgh)	60.50	60.50
Steelton, Pa.	62.50	63.00
Swedeland, Pa.	62.50	63.00
Toledo, O.	60.50	60.50
Troy, N. Y.	62.50	63.00
Youngstown, O.	....	60.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 35.50; tin bronze, No. 225, 48.00; No. 245, 41.50; high-leaded tin bronze, No. 305, 38.75; No. 1 yellow, No. 405, 30.75; manganese bronze, No. 421, 31.25.

ALUMINUM: 99 per cent plus primary ingots 25.90. Secondary No. 12 alloy 23.75-24.25. Deoxidizing grades: No. 1 24.00; No. 4 22.00-22.50.

MAGNESIUM: 99.8 per cent notched ingots 34.50, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 46.00 delivered Connecticut valley.

ZINC: High grade 14.85 delivered. Die casting alloy No. 3, 18.00 delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$34.00–35.00	**$48.50–49.50	....	....	....	....	$60.00–61.00
Boston*	**36.00–36.50	**42.00–42.50	....	....	**43.50–44.00	....	....
Buffalo	45.00–46.00	**45.00–46.00	....	....	**50.00–51.00	....	59.00–60.00
Chicago	44.00–48.00	45.00–46.00	....	47.00–48.00	47.00–48.00	58.00–59.00	66.00–68.00
Cincinnati*	**42.00–43.00	**43.00–44.00	**43.00–44.00	....	**53.00–54.00	....	65.00–66.00
Cleveland	45.00–46.00	53.00–54.00	43.00–44.00	51.00–52.00	54.00–55.00	54.00–55.00	61.00–63.50
Detroit*	**38.00	**46.00	**38.00	**51.00	....	**51.00	....
Los Angeles	38.00	**42.00	....	....	....	....	....
New York*	40.00–41.00	44.00–45.00	44.00–45.00	....	....	....	....
Philadelphia	47.00–48.00	48.00	52.00	....	54.00–56.00	67.00	64.00
Pittsburgh	44.00–45.00	50.00–51.00	46.00–47.00	....	56.00–57.00	....	65.00–67.00
St. Louis*	36.00	44.00	30.00	45.00	....	....	62.00
San Francisco	43.00	48.00	39.00	48.00	50.00	....	....
Seattle	43.00–44.00	**42.00–45.00	36.00–38.00	....	....	....	....

*Brokers' buying prices. **F.o.b. shipping point

Whitehead's NEW DUO RESIN* BINDER

● with controlled oven temperature you can profit by the advantages of our latest lab development.

After three years of laboratory research and field testing, Whitehead is now ready to supply DUO RESIN Binder to progressive foundries for dry sand molding. It is a laboratory controlled product designed to replace pitch. DUO RESIN Binder affords all the desirable properties of pitch; in addition, it gives a consistently strong bond and offers the following highly desired advantages:

1. **EASY SHAKEOUT** — DUO RESIN Binder makes shakeout easy because it burns out while metal is cooling.
2. **BETTER CASTING FINISH** — Permits full benefit of blacking penetration since it does not waterproof sand.
3. **ECONOMICAL** — Promotes economy by saving up to 50% of dry binder, requiring less handling, less storage, less transportation. Takes lower baking temperatures, saving fuel, too.
4. **SIMPLIFIES OPERATION** — Because it eliminates need of blending with other compounds to achieve the desired results.
5. **NON-IRRITATING** — Of bland chemical composition, DUO RESIN is non-irritating.
6. **TESTED AND PROVED** — It has been tested and proved safe in foundry after foundry.

Try DUO RESIN Binder!
Order a trial quantity today.

***For details ask for literature or consult our representative.**

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

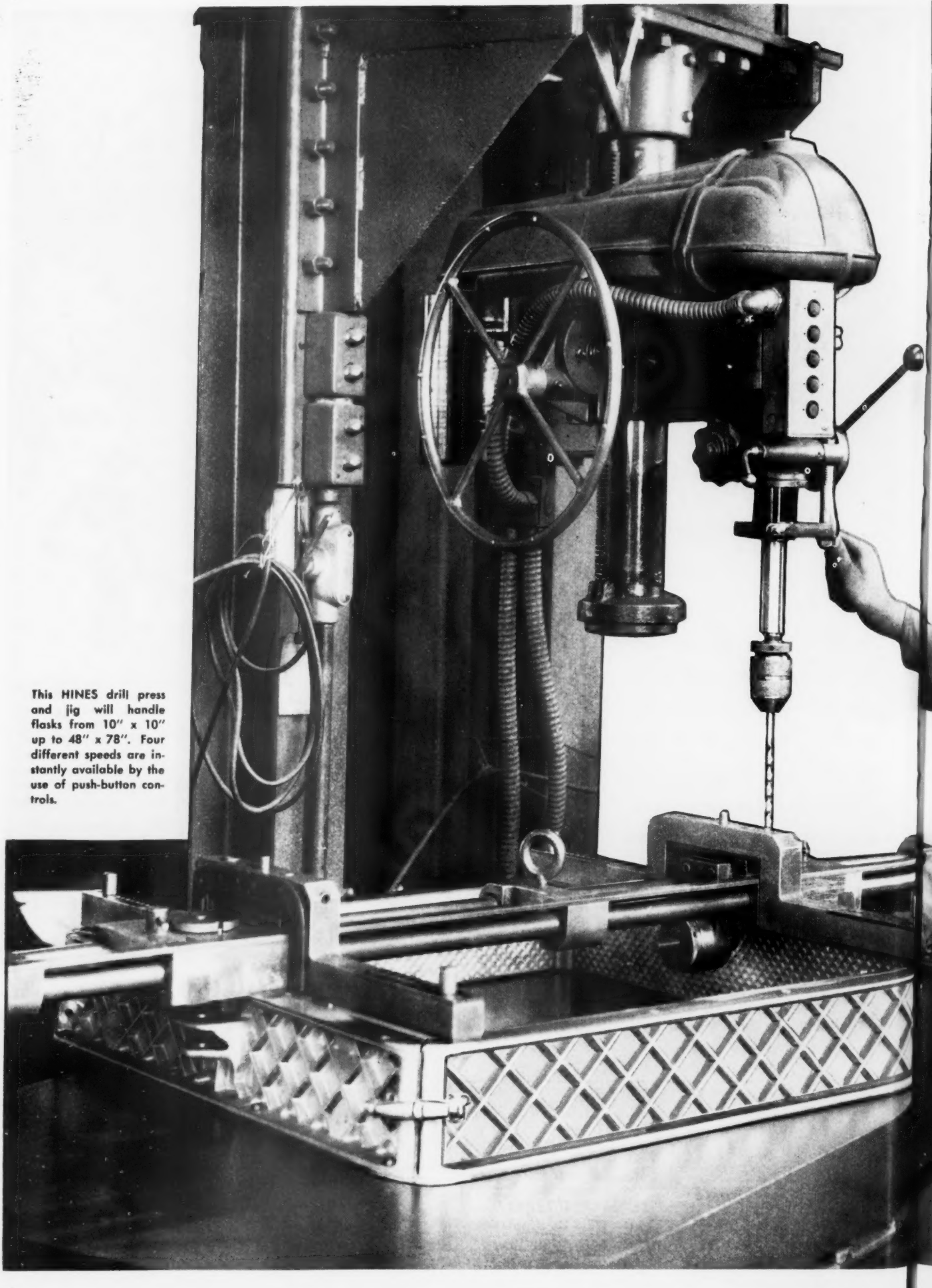
DOB-IT
Ready-to-use core mudding compound

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

Circle 582 on Inquiry Card



This HINES drill press and jig will handle flasks from 10" x 10" up to 48" x 78". Four different speeds are instantly available by the use of push-button controls.

PERFECT ALIGNMENT DOESN'T JUST HAPPEN!

Here's how perfect alignment of cope and drag is "built" into HINES FLASKS:

Here at HINES, we of course know that accurate pins and bushings are necessary for perfect alignment of cope and drag flasks. But, what's even more important is *how* these pins and bushings are installed *on the flask*.

That's why HINES uses a specially-built machine to drill, ream, counterbore and spot-face both cope and drag, for the installation of HINES pins and bushings. The HINES-designed jig is positioned with extreme accuracy by means of guide pins that bear on all four sides of the flask. Two micrometers, at the ends of the jig, control the locating bars so we can drill to ±.003 accuracy. The result — perfect alignment of cope and drag. And, with HINES hard-chrome-plated pins and bushings, you're assured of long, uninterrupted production — smooth, fast pattern draw—free of "chatter", free of "sticking". Remember, too, HINES hard-chrome-plated pins and bushings *won't rust*—flasks are ready for use, no matter how long they've been on the shelf.

So, don't take chances! Specify HINES micrometer-machined flasks! Specify HINES hard-chrome-plated pins and bushings!

THE HINES FLASK CO.

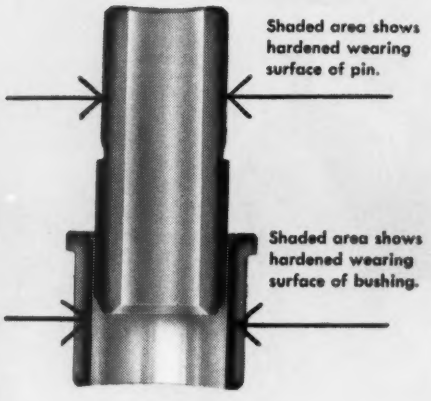
3431 WEST 140TH STREET

CLEVELAND 11, OHIO

HINES POP-OFF FLASK FEMA

carburized and hardened wearing surfaces increase life of UNIVERSAL flask pins and bushings

The wearing surfaces of Universal flask pins and bushings are carburized and hardened so they can take long, rigorous wear and rough treatment in the foundry. Both pins and bushings are double quenched and double drawn to produce strong ductile cores with a fine grain structure that will withstand considerable stress and strain without breaking. Universal flask pins and bushings are precision ground to extremely close tolerances to insure instant, accurate alignment of cope and drag. Plain, taper, round, hexagonal and threaded series pins and bushings are available in a complete range of sizes as regular stock items. For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wisc., or the home office.



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UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 4, MICHIGAN

Circle 584 on Inquiry Card

NOW! Every Core Comes CLEAN

with the NEW CP Core Box Vibrator

The Air-Powered CP Core Box Vibrator is the newest development in foundry equipment for core and pattern making departments. Cores weighing up to 3000 pounds are freed in less than 90 seconds. No more mallet work or sledging to loosen the core . . . just clamp the vibrator to the inverted box; its 9000 orbital vibrations per minute assure a perfect draw. Cores are free of flaws, damaged edges, distorted sections, dimensional variations . . . boxes remain in condition!

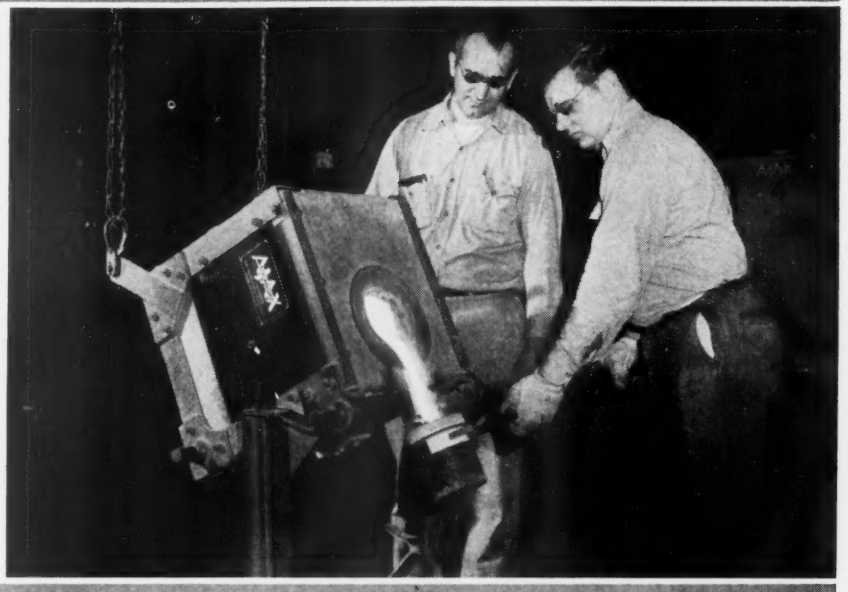
- **Reduces core box maintenance.**
- **Increases core output by eliminating troweling time.**
- **Cores stay true . . . core boxes don't go out-of-square.**

The fast acting air clamp of the CP-219-CBV grabs any cleat up to 6 inches . . . no special adaptors or fixtures are required. Write for details.

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

how Ajax induction melting meets investment casting requirements



. . . at Precision Metalsmiths, Inc.

The special melting requirements of precision investment casting are an old story to Precision Metalsmiths, Inc., Cleveland, Ohio. This one foundry melts ninety-two different ferrous and nonferrous alloys . . . often in small quantities. Many of these alloys require unusual protection from contamination during melting—and substantially all are made to extremely close analyses. Carbon content in some must be kept *below .04%*.

Only an Ajax-Northrup converter-powered induction melting unit could meet the requirements of versatility, purity, and economy so well. That's why four Ajax units now satisfy all the company's production needs. Three 17 pound capacity portable furnaces are each powered by 20 kw Ajax-Northrup spark gap converters; and the fourth, a fifty pound capacity tilting furnace, is powered by a 40 kw Ajax-Northrup converter.

Precision Metalsmiths standardized on Ajax because Ajax-Northrup units cost far less to operate and maintain in operation. They're ruggedly constructed to take the toughest kind of service in stride. Normal converter maintenance is limited to cleaning the gap chamber and inspection at three month intervals. For additional details, write Ajax Electrothermic Corp., Trenton 5, New Jersey, requesting Bulletins 14-B and 27-B.

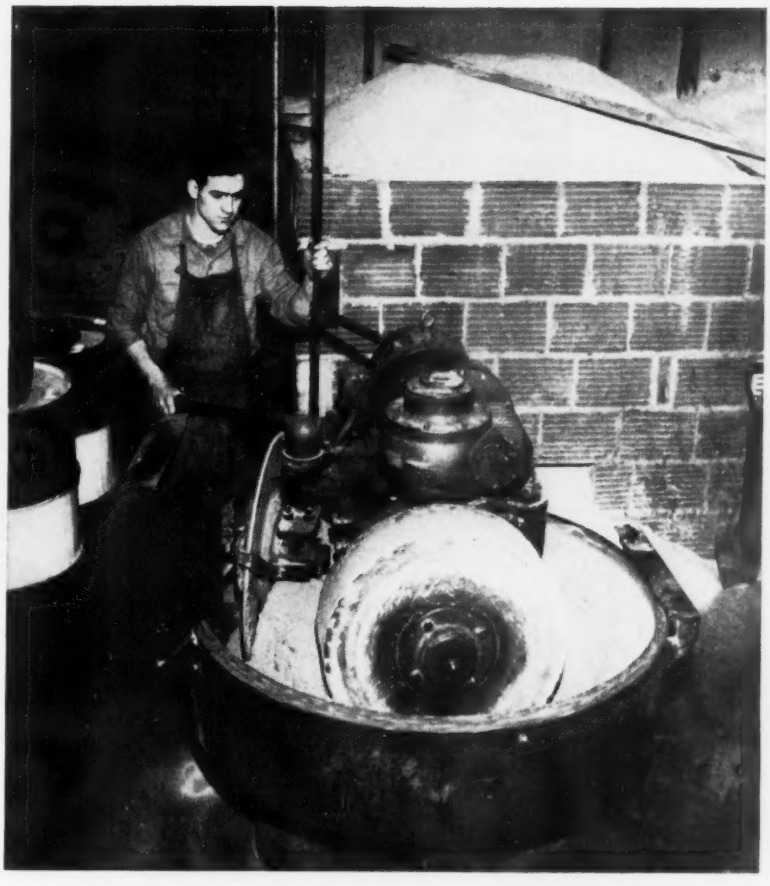
Associated Companies: Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.

AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING

Circle 586 on Inquiry Card

the Clearfield Mixer



This No. 404 Clearfield Mixer has been in operation for eight years in the core shop of the Railway and Industrial Engineering Co. of Greensburg, Pa., makers of electrical switchgear for substations and generating stations. During that time it has required only very few minor repairs and "has paid for itself many times over."

gives you BETTER FOUNDRY SAND

Better, because bond and moisture are uniformly distributed. By breaking down all lumps, caking is eliminated, freeing all material from the bottom surface. Clearfield Mixers, with vertical rotating mullers and unique rotating pans, are faster in performance and result in better production.

Write for Catalog No. 83. Gives full details on the Clearfield Mixer for your need.

CLEARFIELD MIXER

fast,
thorough
sand preparation

CLEARFIELD
MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A

Circle 587 on Inquiry Card

Robinson Air-Activated Conveyors*
Serve the FORD RIVER ROUGE FOUNDRY
ROBINSON Air-Activated CONVEYOR SYSTEMS
80-W FIFTH AVENUE • NEW YORK 11, N. Y.
Robinson Air-Activated Conveyor System
One Highlight of this LYNCHBURG FOUNDRY Installation
Remarkably Accurate Batches of Sand Automatically Weighed and Transported
ROBINSON Air-Activated CONVEYOR SYSTEMS
80-W FIFTH AVENUE • NEW YORK 11, N. Y.
The Place...
United States Steel's new Foundry — Edgar Thompson Works
The Job...
Pneumatic Conveying of Bentonite and Peerless Bond
The Equipment...
Robinson Air-Activated Conveyor Systems
CONVEYOR SYSTEMS
80-W FIFTH AVENUE • NEW YORK 11, N. Y.
Robinson Air-Activated Conveyor System
... as installed in another large captive foundry with a headline name.
CONVEYOR SYSTEMS
80-W FIFTH AVENUE • NEW YORK 11, N. Y.

Robinson *Air-Activated* System

Conveys Sand Economically

On-the-job operation in several leading foundries has proved that the Robinson System is —

- **The most practical for conveying foundry sands and bonds**
- **The most economical in air consumption**
- **The least affected by abrasion and costly maintenance**
- **Adaptable for complete automation**
- **Capable of weighing and conveying precisely accurate batches**

On the opposite page, we are showing the visuals of four advertisements that recently appeared in *Foundry*. They tell the Robinson Conveyor story as it is developing in four well-known foundries. By permission, three can be and are named; by request the fourth name is omitted but it can be said that this foundry is one of the largest and most modern production foundries in the East.

If you are planning a new foundry or a major expansion you should investigate thoroughly *all* features of the Robinson Air-Activated Conveyor System. If you are faced with a modernization program you could not find a better way to modernize than by changing over to the Robinson Air-Activated Conveyor System for handling foundry sands and binders. The Robinson System should be a must in your plans. Write to us about them.

ROBINSON *Air-Activated* **CONVEYOR SYSTEMS**

A Division of
Morse Boulger Destructor Co.

DEPT. W • 80 FIFTH AVENUE • NEW YORK 11, N. Y.

Representatives in Principal Cities

Circle 588 on Inquiry Card

NICHOLLS "AIROMATIC"

Automatically, completed mold is turned over and transferred to conveyor. Just one of the better-than-human automatic operations.

You Get Consistent High Quality with Nicholls Fully-Automatic Push-Button Molding Machines

Get a continuous flow of molds—better molds. Eliminate money-squandering risk and error. Our new No. 24 Type C heavy-duty molding machine culminates almost 50 years of experience to give you better molds at a lower cost—automatically. And automatically, profits increase as costs of production and materials decline—thanks to Nicholls. Write us for details about Nicholls heavy duty molding machines.

Cost sheets too, are in better shape, when you mold on Nicholls machines.

Now Study These Cost-Cutting Advantages

- Pneumatic Pattern Draw.
- Air-Operated Car-Type Squeeze Head.
- Built-in Flask, Roll-in, Roll-out Device.
- Sand Hopper That Measures.
- Flask Feed-in Elevator.
- Flask Indexing Device.
- Sand Spill Upset.
- Mold Turnover and Transfer.

WM. H. NICHOLLS CO., INC., Richmond Hill 18, Long Island, N. Y.

NICHOLLS

how to assure sound finished castings

Here are results proved by leading foundries from using Purite fused soda ash.

Sulphur control: Purite reduces sulphur content to a specified allowable per cent. When price or shortage forces the use of high sulphur scrap, you can still turn out quality castings.

Less bridging: Purite flux in the cupola increases fluidity of the charge, insuring better mix of materials, hotter melting and uniformity of process and product.

Economy: Purite is 100% fused soda ash; contains no inert waste. The solid two-pound pigs all go into the mix; none of it blows away as lost dust.

Convenience: Purite pigs are non-crumbling two-pound blocks. Handle easily. You measure out what you want simply by counting. Store indefinitely without loss.

Supply: Leading foundry supply houses distribute Purite in every area. For the name of your nearest supplier or for more information, please write—

MATHIESON

MATHIESON CHEMICALS
OLIN MATHIESON CHEMICAL CORPORATION
INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

3598

Circle 590 on Inquiry Card

LITHIUM

...the Miracle Metal

Over 100 Brass & Bronze Foundries Can't Be Wrong!

Last year over 30,000,000 pounds of copper were degasified with Lithium Metal . . . and the volume is constantly increasing. A little Lithium goes a long way. It's a fact that only 0.005% metallic Lithium makes a sounder, more uniform, nonferrous casting . . . in less time with less trouble and at lower cost.

Large size Lithium Cartridges (108 grams) are used for the degasification of large melts of copper including high conductivity metal. Small Lithium Cartridges (2¼, 4½ and 9 grams) are for foundry use in the refinement of high temperature copper, brass, bronze, and nickel-silver castings. Even the salts of Lithium (Carbonate and Chloride, especially) hold great promise for heat treating by reason of their properties in lowering bath melting points.

Is *your* foundry using Lithium? Truly the "ally of alloys," Lithium could hold the same hope for *you*. Look into Lithium. Write for details on actual foundry tests.

. . . trends ahead in industrial applications for lithium

LITHIUM CORPORATION OF AMERICA, INC.
2600 RAND TOWER
MINNEAPOLIS 2, MINN.

MINES: Keystone, Custer, Hill City, South Dakota • Bessemer City, North Carolina • Cat Lake, Manitoba • Amos Area, Quebec • BRANCH SALES OFFICES: New York Pittsburgh • Chicago • CHEMICAL PLANTS: St. Louis Park, Minnesota • Bessemer City, North Carolina • RESEARCH LABORATORY: St. Louis Park, Minnesota

Circle 591 on Inquiry Card

Facing Page—ITEM 592→

Rake in big savings by letting us engineer your grinding jobs

Tremendous new research and engineering facilities now allow Peninsular to make you this offer: Let our abrasive engineers make a thorough examination of your grinding operation. Based on our experience, we can practically guarantee to help you rake in savings.

At left is an example. On a typical snagging job like this, previous wheel cost per lb. of metal removed was $.0607, with 1.165 lbs. removed per cu. inch of abrasive. With new Peninsular wheel, cost per lb. of metal removed dropped to $.0485, with 1.458 lbs. removed per cu. inch of abrasive. Performance improved 25%.

Call, write, or wire us today!

Resinoid and Vitrified Grinding Wheels

PENINSULAR

GRINDING PENINSULAR **WHEELS**

PENINSULAR GRINDING WHEEL DIVISION—ABRASIVE AND METAL PRODUCTS COMPANY—DETROIT, MICHIGAN

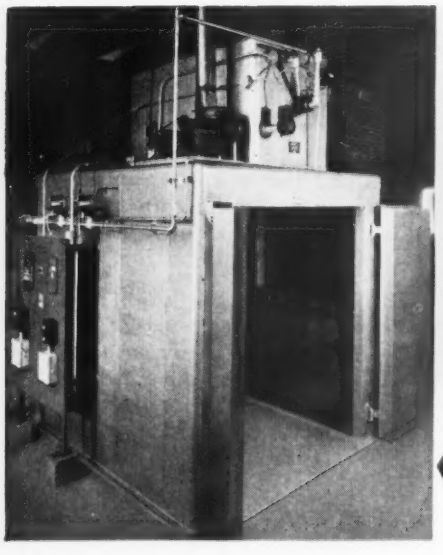
IS THE HEAVY HAND of OBSOLESCENCE

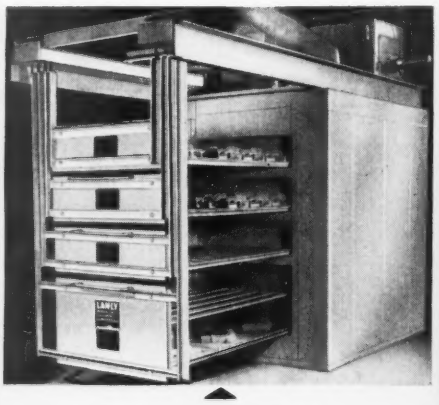
Retarding Your Production

OLD STYLE, INEFFICIENT CORE OVENS

with antiquated hand firing and charging methods can add appreciably to your operating costs.

Then too, there is the problem of a high percentage of rejects in old oven production. Can you afford this?





1. Drawer Type Oven
2. Single Compartment Rack Type Oven
3. Car Type Oven

Isn't this an opportune time to examine closely the oven facilities of your foundry for a possible improvement? The average foundry requirements can be met with standard LANLY units. Custom designed units for core baking, pasting and mold drying are part of LANLY'S services, as well as ovens for casting conditioning and heat treating.

WRITE FOR THE LATEST CATALOG AND FACTS ON ANY INSTALLATION

LANLY
FOUNDRY OVENS
THE LANLY COMPANY • 780 PROSPECT AVE
CLEVELAND, OHIO

KOLD-SET

PATENT PENDING

NON-DEFORMING
KOLD SETTING CORE
AND MOLD BINDER

CUTS PRODUCTION COSTS

No Ramming

50% Less Rodding

Controlled Set Times

Uniform Hardness

Reduced Baking Time

Rough Cleaning Eliminated

Accurate Core Dimensions

1. Controller Body 2. Die
3. Slide
4. Gear Ring 5. Governor Bracket

Above iron castings are shown immediately following removal from the flasks. They were made in Kold-Set molds, using Kold-Set cores, and have finished weights ranging from 150 to 800 lbs.

Castings made in Kold-Set bonded sand show precise dimensions and excellent surface before finishing operations.

By using Kold-Set Binder and Activator with your sand, you get sand that pours freely into the boxes or molds; sets fast at predetermined set times; then bakes out with uniform density and hardness.

When the finished casting is cooled and removed from the flask, the sand, having lost its binding properties, collapses and falls free of the core cavities and mold surfaces. No rough cleaning, only shot blasting is required. Grinding is reduced to a minimum.

Sound interesting? Even remarkable?

You bet it is, and it can drastically reduce the production cost of every casting you make.

FREE →

Send for this bulletin

"QUICK FACTS"

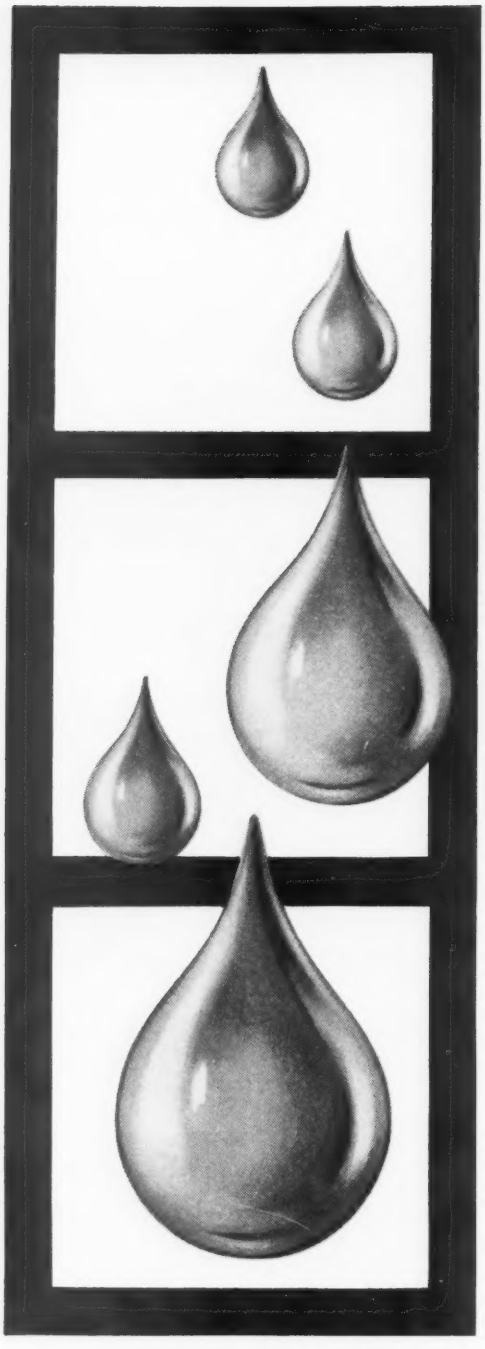
It summarizes step-by-step details and tells how you, too, can save time, money and labor in core and mold making and finishing.

G. E. SMITH, INC.

246-A Washington Road Pittsburgh 16, Pa.

Circle 594 on Inquiry Card

Every drop exactly alike

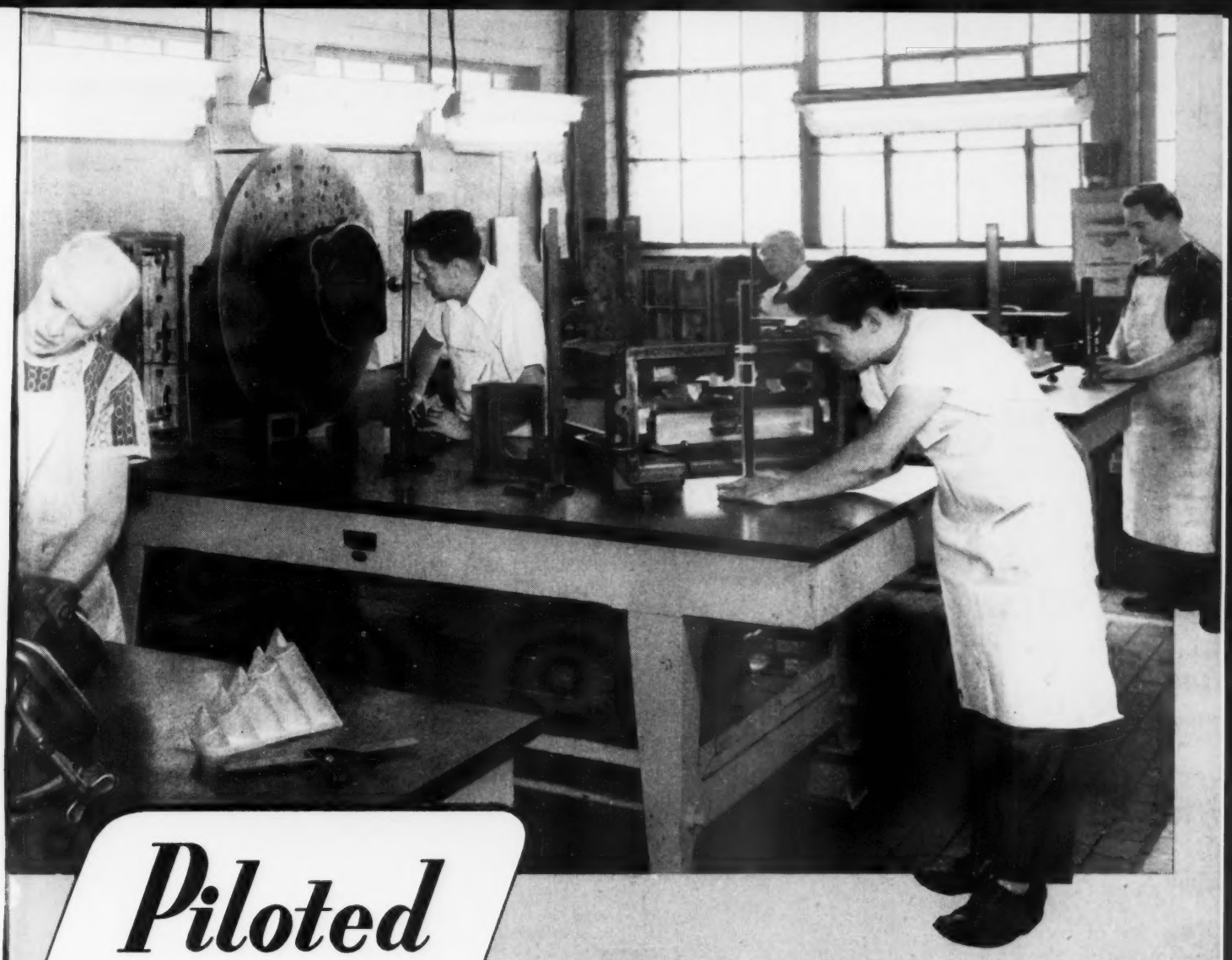


Thiem Core Oils

Thiem
PRODUCTS, INC. • Milwaukee 14, Wisconsin

Circle 595 on Inquiry Card

Facing Page—ITEM 596→



Piloted Precision ...from Print to Pattern

Translating precision from your blueprints into patterns is the function of our layout and inspection department. Here skilled hands carefully pilot your patterns through every operation performed on them. The latest methods and the finest equipment are used in this important work. Only through such painstaking layout and inspection can unvarying high quality be maintained . . . and it is on such quality that City Pattern Foundry & Machine Company has built its reputation.

"Piloted precision" is another reason why leading manufacturers rely on City Pattern Foundry & Machine Company for the utmost in accuracy, economy and production utility in wood and metal patterns.

City Pattern Foundry & Machine Company's Shrinkage Conversion Tables save time and eliminate errors in shrinkage calculations. Your letterhead request will bring a set of these handy tables without obligation.

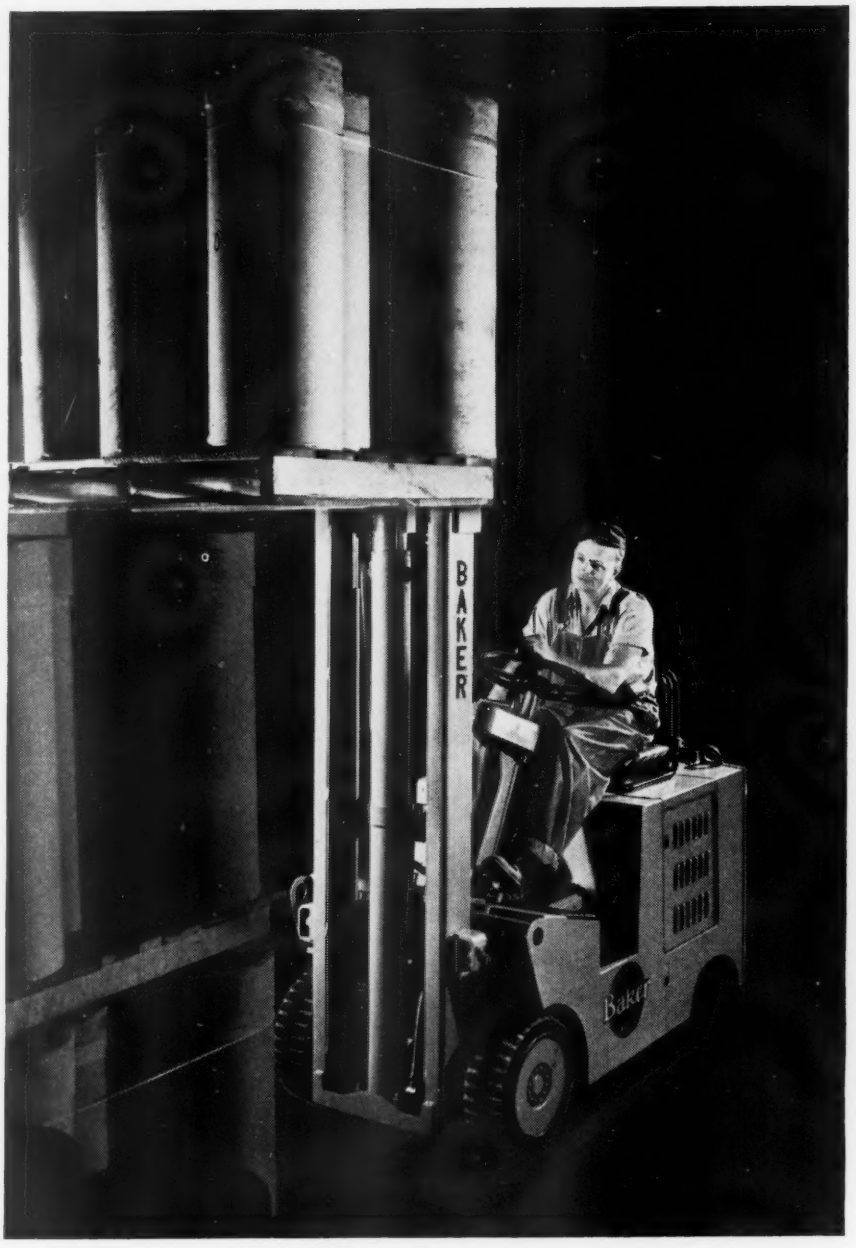
Setting the Pattern in Patterns

CITY PATTERN
FOUNDRY AND MACHINE CO.

1161 HARPER AVENUE • DETROIT 11, MICHIGAN

the gas truck that does more work because it spends more time on the job!

BAKER "FG"



here's why...

Every step in the design of the new Baker "FG" gas fork truck was aimed at this end result: Maximum dependable and efficient performance, and longest life. The power plant, for example, is a heavy-duty gas engine designed expressly for rugged industrial truck service, power rated to truck capacity and geared to operate at optimum RPM. Compact rigid power train without troublesome universal joints... split clutch housing for better accessibility... single oil supply for entire assembly... full-floating, self-energizing, self-equalizing hydraulic brakes with one-point adjustment... these are a few of the features that mean *more time on the job.*

Our confidence in the "FG" is backed by a full 6-months' warranty—the only gas truck offering this protection. Capacities up to and including 6000 pounds. Write for specific bulletins.

Baker®
handling equipment

THE BAKER-RAULANG COMPANY
1223 WEST 80th STREET • CLEVELAND 2, OHIO

A Subsidiary of Otis Elevator Company

6G-1

PICKER . . . your ONE stop

for every need in industrial radiography

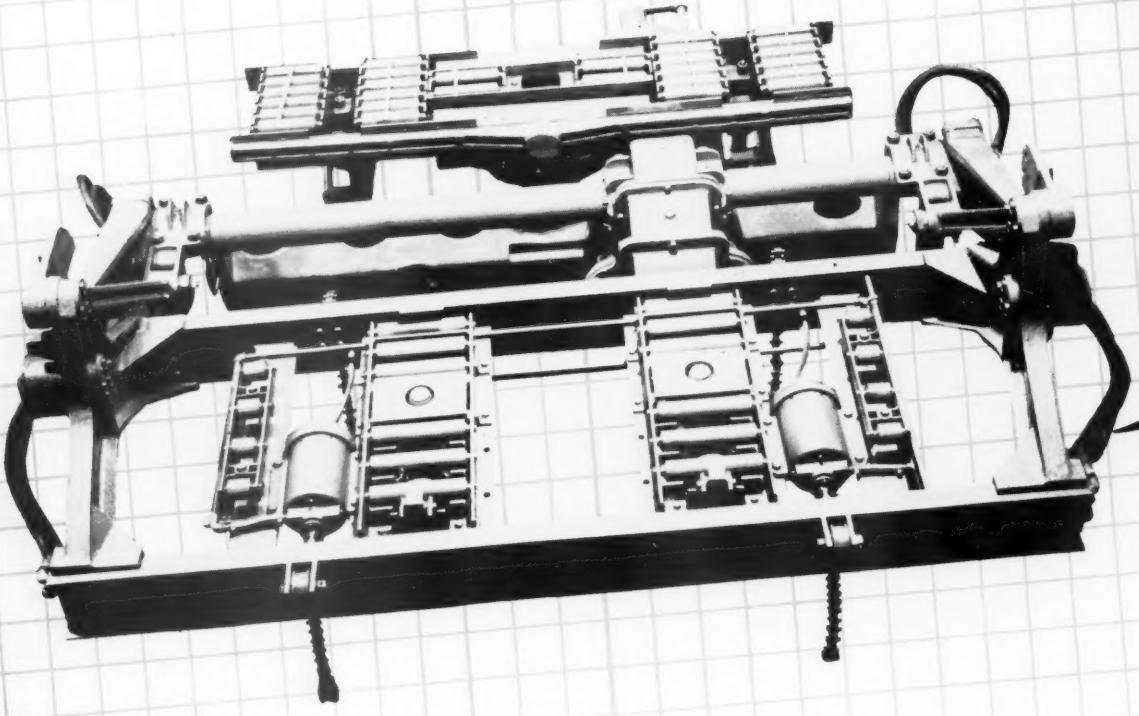
PICKER X-RAY CORPORATION, 25 SO. B'WAY, WHITE PLAINS, N. Y.

BRANCHES IN PRINCIPAL CITIES IN U.S.A. and CANADA

Picker x-ray

HERMAN

Charging Conveyor Machine



IDEAL
for short-run work

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

If your type of work calls for short runs, the Herman Charging Conveyor Rollover and Draw Machine is the modern, economical answer.

Its extreme flexibility, *on either cores or molds*, makes it possible to produce a tremendous range of sizes and types of work.

This comparatively new machine in the HERMAN line is already being widely used in the foundry industry. Foundrymen choose it because it's versatile and operates equally well with either a Jolt Machine or Sandslinger.

It is produced in our broad range from 500 to 20,000 lb. rollover capacities.

Typical Cycle

1. Core box filled with sand and placed on the jolt unit.
2. Power lift conveyor lowers box on sub-plate.
3. Core box is jarred and elevated by power lift conveyor to standard conveyor level.
4. Box goes to Charging Conveyor Rollover and Draw Machine, manually or by pusher mechanism.
5. Pneumatic core box and core plate clamps engage rammed core box for rollover operation.
6. After rollover, core clamps are disengaged and slow draw operation starts.
7. Vibrators separate bond between core box and sand.
8. Fast draw operation checked by speed control device and core box gently deposited directly on discharge conveyor and rolled away on companion conveyor.
9. Inverted turnover plate and core box rolled back to upright position, pneumatic clamps disengaged and box returned to either jolt station or storage.
10. Another rammed core box should, of course, now be at the Charging Conveyor Rollover and Draw Machine for the production of another core.

Why don't you get in touch with us right now for more information. Write for our catalog No. GC-11-53.

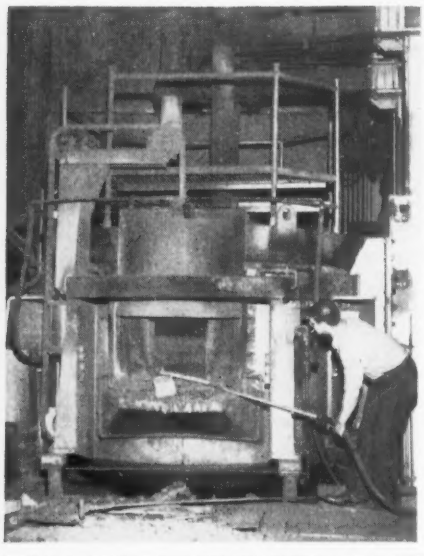
HERMAN

Best Known Name in Molding Machines

DUST and FUME topics

WHEELABRATOR CORPORATION ■ **Mishawaka, Indiana**

Wheelabrator® dustube® collector traps electric furnace fume, improves working conditions



Constant emission of fine carbon particles from an electric furnace in a large Michigan automotive foundry is controlled successfully by a continuous automatic Wheelabrator Dustube Collector.

Excess metal remaining after pouring ladles are filled is dumped in the holding furnace so as not to cool down and to facilitate its later use when enough has been collected.

Fine carbon particles from the heated metal are prevented from permeating the foundry atmosphere and becoming a source of irritation by the efficient operation of the Wheelabrator Collector.

No tools necessary for installing or replacing individual cloth tubes

Each cloth tube in a Wheelabrator dust collector has a loop at the top and a flexible steel ring sewed in the bottom. These features permit the tube to be slipped on to the shaker mechanism bar and to be inserted in the cell plate by hand, without tools.

Besides facilitating original installation, the simplicity of the operation also makes possible quick and simple replacement of tubes.

Foundry eliminates dust from annealing pots, sand handling

The extremely dusty operations of packing and unpacking pots in which hard iron castings are annealed are ventilated by a Wheelabrator Dustube Collector at the Ontario Malleable Iron Company Ltd. Despite heavy volumes of dust, work areas of this foundry are kept exceptionally clean.

Efficient dust control brings savings in foundry operations

Uncontrolled dust hampers production and increases maintenance costs. Wheelabrator Dustube cloth-tube-type collectors trap dust at its source and filter it from the air stream. Thus, hidden expenses are eliminated from many foundry operations.

For more information, write today for your copy of Catalog 372C.

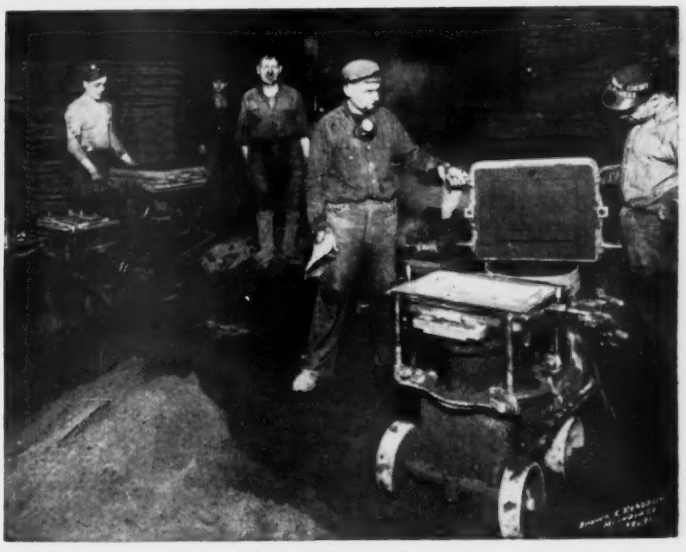
WHEELABRATOR
CORPORATION

505 S. Byrkit Street, Mishawaka, Indiana

Facing Page—ITEM 601→

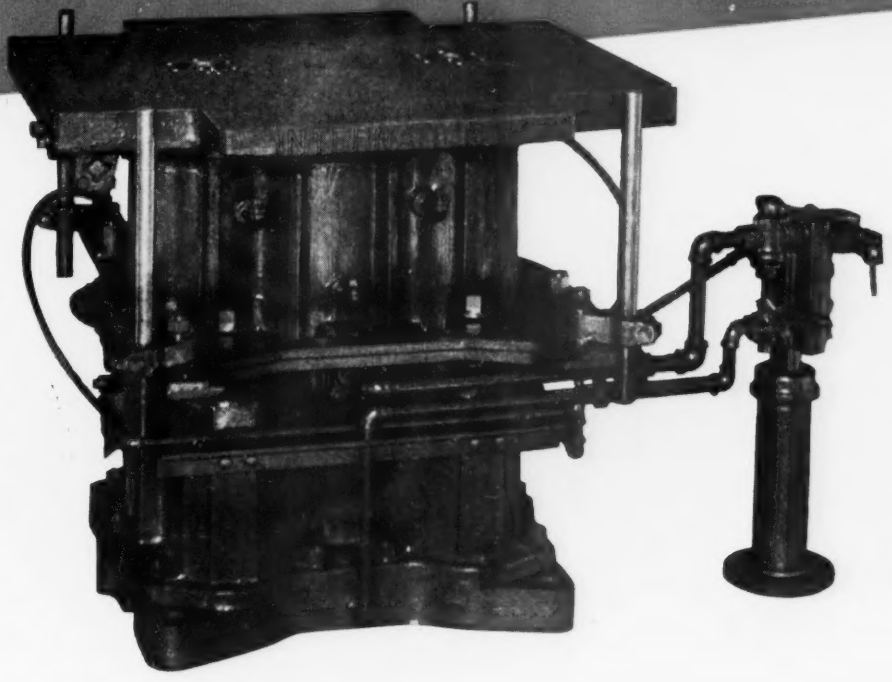
INTERNATIONAL TYPE

JDP MACHINE



The JDP has the exclusive Double Jolt Feature. A **Positive** Jolt and a **True** Ram.

TWO JOLT SECTIONS combined in one integral unit.



The JDP is adaptable to a large range of work, suitable to the pin lift style. It is readily adjustable. The incorporation of the Double Jolt Feature, combined with the sturdiness of the machine, gives a positive ram throughout the mold.

The lifting section is guided by hardened steel parts for long lasting wear. All valves are conveniently located for ease of operation. Wearing parts can be readily replaced.

The JDP MACHINE

by

INTERNATIONAL

International Molding Machine Company • La Grange Park, Illinois

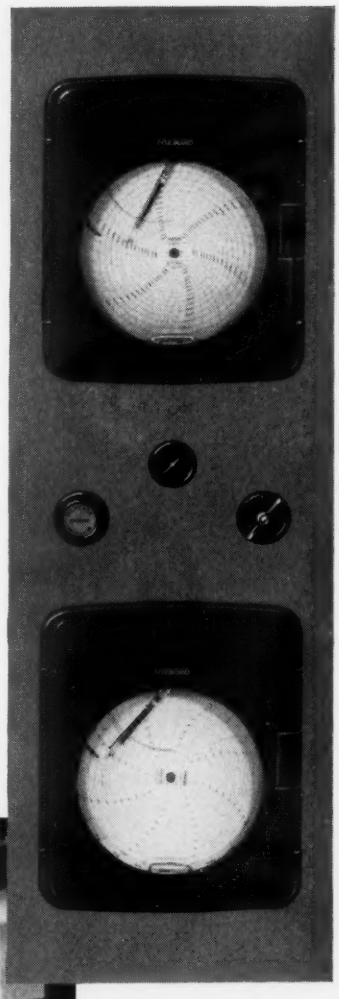
Improves Any Cupola's Performance . . . Automatically!

Foxboro Air Weight Control . . .

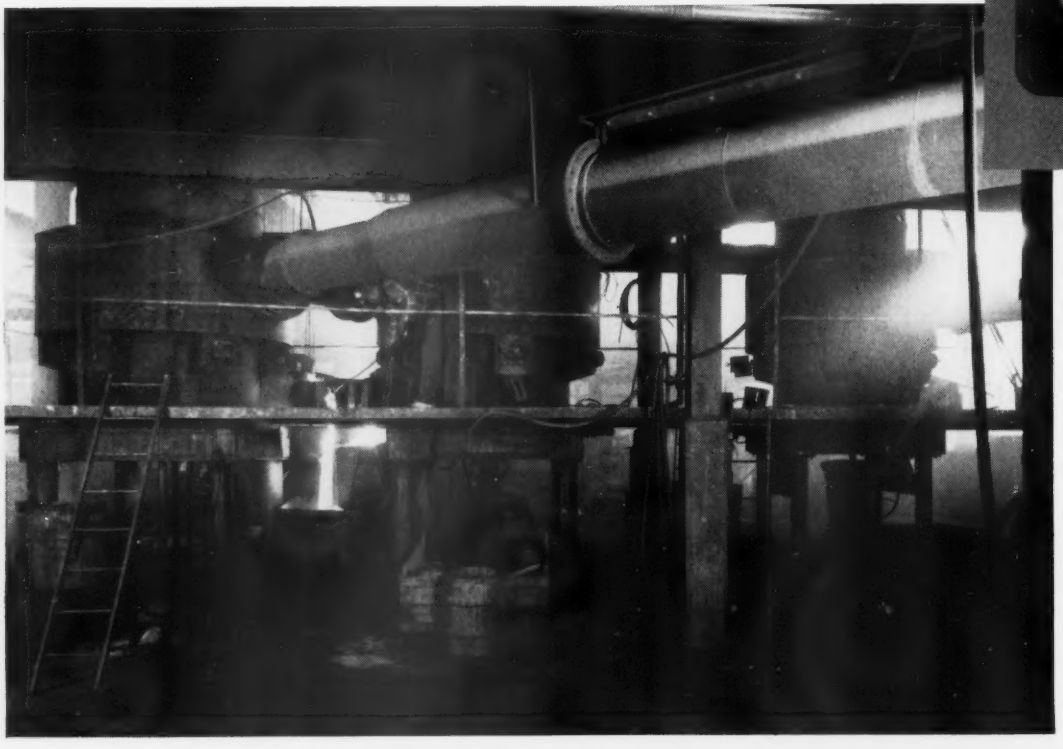
More than 1500 successful applications prove it! Foxboro Air Weight Control *automatically* assures higher, more uniform temperatures . . . whether it's on a small, hand-charged unit, or a continuous hot blast melting system.

Here's why. The Foxboro Air Weight Controller automatically "weighs" air for the cupola blast . . . corrects for atmospheric changes. Coke charge always gets the right amount of oxygen for best combustion, regardless of the weather. The pay-off is faster, more uniform melting . . . higher quality castings day after day. What's more, there's a substantial fuel saving, and practically *no* pigging!

Whether *your* cupola is simple or highly mechanized, Foxboro Air Weight Control is fundamental to its top performance. For full details, write for Application Engineering Data Sheet, or contact a Foxboro Sales Engineer.



Modern Foxboro Cupola Control Panel includes, in addition to Air Weight Controller, a Foxboro Windbox Pressure Recorder which charts cupola conditions . . . permits operator to quickly correct for changes.



In typical installation (left), two Foxboro Air Weight Controllers regulate blast from two Spencer Blowers. Blowers supply one #3, and two #6 Whiting Grey Iron Cupolas.

THE FOXBORO COMPANY, 327 NEPONSET AVENUE, FOXBORO, MASSACHUSETTS, U. S. A.

FOXBORO
REG. U. S. PAT. OFF.

AIR WEIGHT CONTROLLERS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

He has to see for himself!

When it comes to blast cleaning, a foundryman can't believe claims and promises. He has to see for himself the kind of cleaning job an abrasive does. His next question is: What does it cost in operation? Different jobs may require different abrasives but the result should always be the same—the *best* job at *lowest cost.* Malleabrasive and Tru-Steel abrasives give you that. Whichever you need, Pangborn has the right abrasive for your job. Talk to one of our sales engineers or write PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Maryland.

Pangborn DISTRIBUTORS FOR

MALLEABRASIVE® AND

TRU-STEEL SHOT

3A

Next Page—ITEM 604→

SAN-BLO..."MAJOR FACTOR

HOW ARE YOU FIXED FOR CORE BLOWING?

Can your present machines blow heavy oil sand, resin sand or regular molding sand — *efficiently?* Can they blow CO_2 sand with *correct permeability?*

SAN-BLO CORE BLOWERS CAN!

IN REDUCING OUR CORE COSTS!"

LEBANON STEEL FOUNDRY
Stainless, Special Alloy and Carbon Steel Castings
LEBANON, PENNA.
"in the Lebanon Valley"

W.H.WORRILOW *President*
T.S.QUINN *Treasurer*

March 2, 1956

The Federal Foundry Supply Co.
San-Blo Division
4600 East 71st St.
Cleveland 5, Ohio

Attention: Mr. George E. Miller
Sales Manager

Dear Mr. Miller:

The use of SAN-BLO core blowers, in conjunction with a dielectric oven for subsequent and immediate baking of blown cores, is a natural and has worked wonders for us. The photograph of our installation, showing the arrangement of the two pieces of equipment, definitely points out the simplicity of the arrangement -- the oven just about keeping abreast of the core blowers, when operating at full capacity.

Incidently, this arrangement has enabled us to produce a 30# core at a rate increase from about 525 pieces per turn to 800 pieces--with less handling, less scrap, truer dimensions and in the mold in quicker time.

Needless to say, it simply means this: All that we did here was to allow the SAN-BLO machines to go full blast, eliminating delays due to handling and baking of the blown cores. Our two SAN-BLO units definitely have been a major factor in reducing our core costs, to the point where our only concern today is: "What else can we blow on our SAN-BLO's?"

Incidently, thanks to you and to your personnel for your part in our story.

Very truly yours,
LEBANON STEEL FOUNDRY
Philip A. Repino
Plant Engineer

PAR:je

• SAN-BLO sales engineers will welcome an opportunity to analyze your requirements —so you can increase the efficiency of your core room. Please forward your request to our Cleveland Office.

Manufactured by

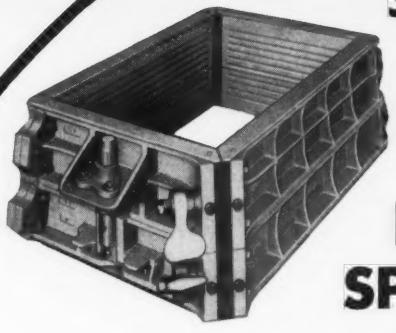
San-Blo Division

The **FEDERAL FOUNDRY SUPPLY** *Company*
4600 EAST 71st STREET · CLEVELAND 5, OHIO

WE DO ONE THING AND DO IT WELL!

Producing flasks and jackets is our specialty and you benefit from this specialization.

FREMONT MAGNESIUM FLASKS



SAND CANNOT LODGE IN THE CORNERS

▼

FREMONT SPREADLOCK FLASKS

Long-life, easily replaceable, live rubber corner inserts completely close the corner gaps.

MORE EXACTING WORK

Precision machined inside surfaces and flanges. Steel faced top and bottom flanges.

LONGER SERVICE

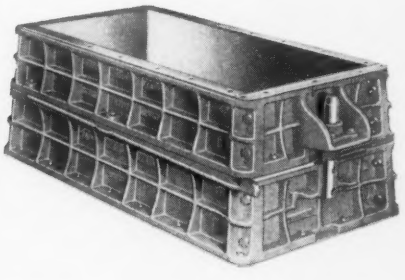
Magnesium has twice the tensile strength of aluminum . . . takes more abuse.

EASIER HANDLING

Magnesium weighs 1/3 less than aluminum.

PERFECT ALIGNMENT GUARANTEED

by the one-inch
GROOVLOCK FOOLPROOF PIN



▼

FREMONT STANDARD SLIP FLASKS

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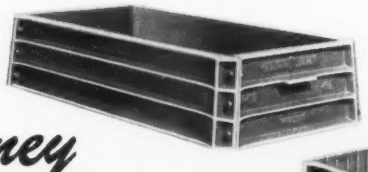

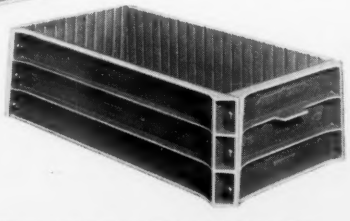

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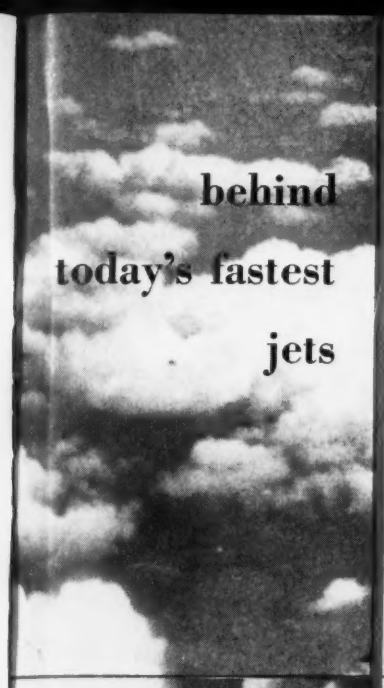

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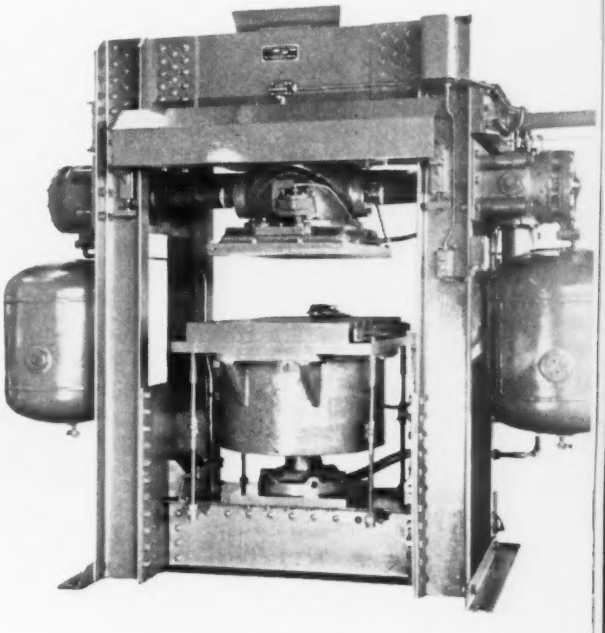

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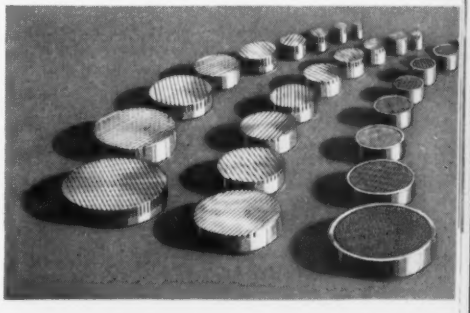

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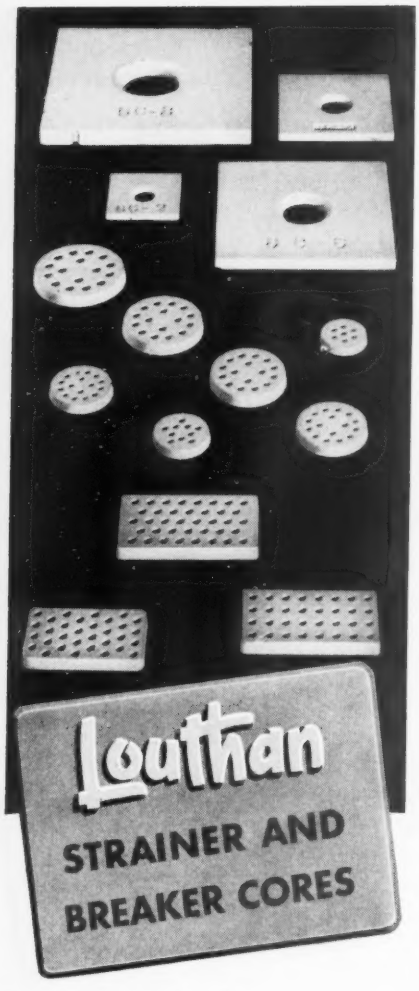

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Readers' Comment

It Makes the Difference

TO THE EDITORS:

My congratulations and felicitations to you on the occasion of the issuance of the May issue of FOUNDRY. I especially want to commend you for the article "Management Makes the Difference." If you continued that theme forever you would, in my opinion, be rendering an immeasurable service to the industry.

GILBERT S. SCHALLER
Professor
University of Washington
Department of Mechanical Engineering
Seattle 5

* * *

Serving Foundry Management

TO THE EDITORS:

I have read with great interest the special report in FOUNDRY's May issue entitled "Management Makes the Difference." The article summed up the various functions of management; methods used by progressive foundry management in performing these functions, and assistance given foundry management by various associations within the industry.

The article was excellent but I feel that it touched too lightly upon the subject of industrial relations and, at the same time, omitted mention of the foundry association which has been aiding management in this area for 58 years.

Labor-management relations become more complex each year. It is a subject which is distasteful to many in management, one they would rather not think about, yet through poor planning or inept negotiating a management may find that it has given away the right to manage; it may find that its wage rates put the company at a competitive disadvantage; it may find itself bothered by frequent and costly strikes.

The National Foundry Association is the only organization whose principal activity is in the field of employer-union relationships, within the foundry industry. Our labor agreement file is quite extensive, our experience in dealing with labor techniques and developing management tactics against the major unions in the foundry industry has been accumulated through years of service.

The average foundry is a small unit, unable to afford the luxury of a labor relations staff. The NFA strives to be its labor relations staff through continually reading, digesting and analyzing pertinent items on the subject which affects it, by assembling comparative wage data, by pre-negotiation consultation, by contract analysis, and by holding area meetings with other foundries on industry bargaining trends or innovations. With the larger firms, we serve as an adjunct to their labor relations department, particularly in the labor relations research and clearing-house of information function.

It has been said that even the largest company does not come to the bargaining table as adequately prepared as its union counterpart. Unfortunately, this statement is true and the gap between the preparation of the average medium-size or small foundry and its union counterpart is even greater. Progressive foundry management realizes that the best method of closing the gap is through sharing ideas and information through one central clearing house—the NFA.

Foundry technology has advanced rapidly through the media of technical societies and trade groups. Similarly, better labor relations practices and policies within the foundry industry are being attained through the medium of the National Foundry Association.

C. T. SHEEHAN
Executive Secretary
National Foundry Association
53 W. Jackson Blvd.
Chicago 4

* * *

Likes Editorial

TO THE EDITORS:

Congratulations on your editorial in the April issue titled "A Guide for Congress." Yours is a very well written article on a subject of vital interest to everyone in the metal industry.

I should like very much to send our Congressmen from Illinois and the Small Business Committee copies of your article.

Would you be so good as to send me a dozen or more copies.

G. E. PATRICK
Wagner Malleable Iron Co.
Decatur, Ill.

* * *

1955 Index Is Available

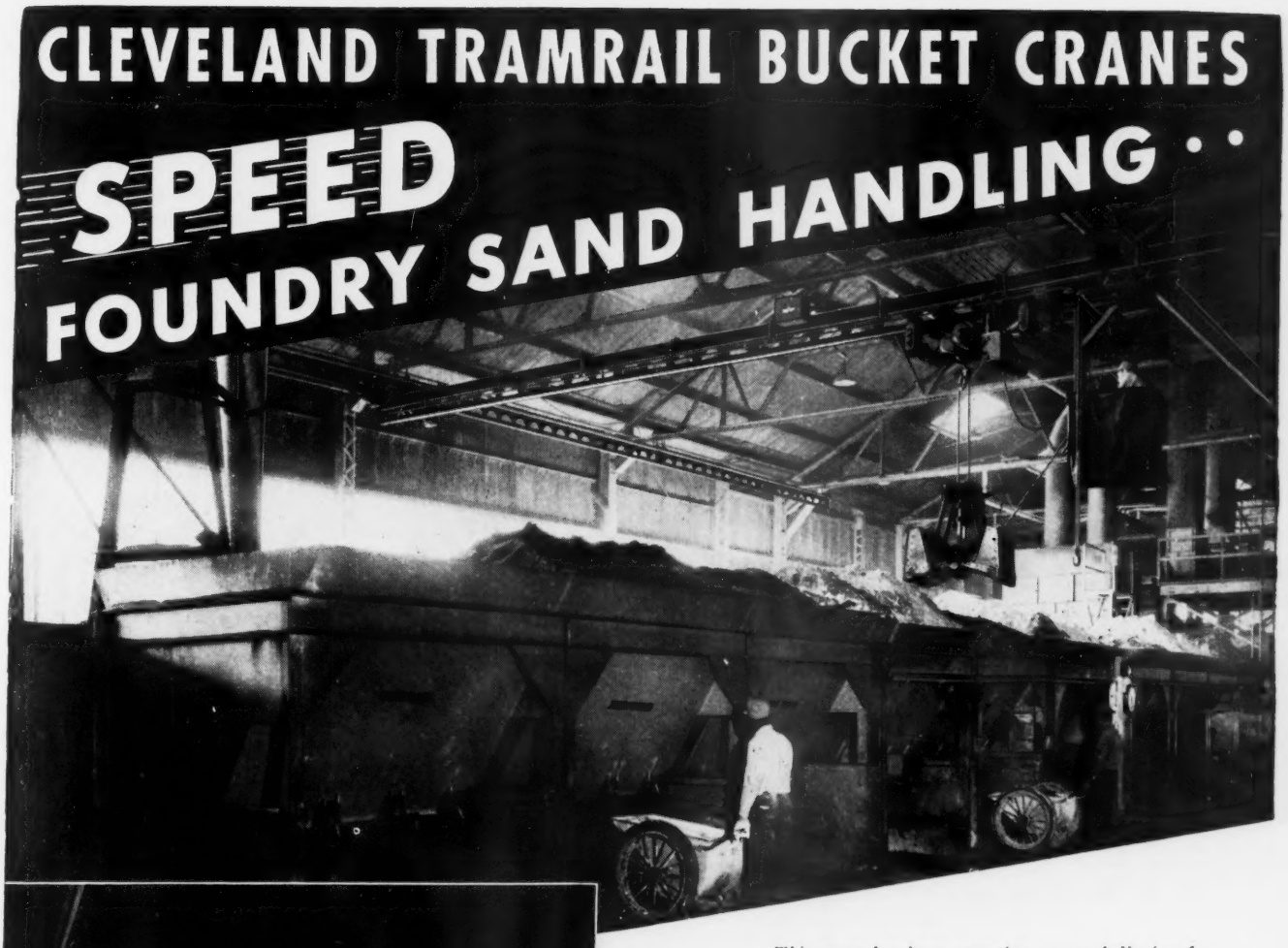
TO THE EDITORS:

May I again take this opportunity to thank you for your wonderful contribution to the foundry industry via the FOUNDRY magazine. I have been a subscriber for about 25 years. May I have a copy of the 1955 index to FOUNDRY Vol. 83. Thanks.

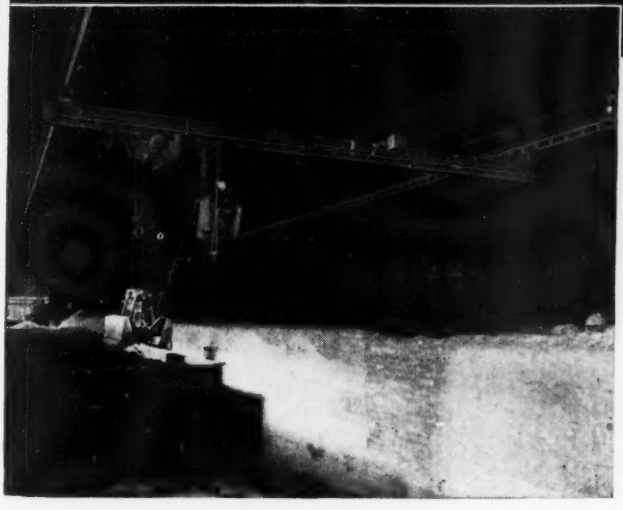
BEN J. REJONA
354 *Kendalia*
San Antonio 21, *Tex.*

CLEVELAND TRAMRAIL BUCKET CRANES

SPEED FOUNDRY SAND HANDLING . . .



This crane has been operating successfully for 4 years, 24 hours a day. The single line grab bucket requires no motor and is of a type that eliminates most of the usual impact on crane. The bucket is easily detached when it is desired to handle loads with the crane hook.



The cranes are 44'-0" long and operate on two-track runways. They are controlled from either platform or floor by pendant push-button stations.

AN AVERAGE of nine 60 ton gondola cars of sand are handled every 24 hour working day with two Cleveland Tramrail Platform-controlled motorized cranes with ½ yard buckets in a large Illinois foundry.

Some of the sand is taken to storage and later transferred to bins. Other sand is taken to storage, then to drier and finally to bins, thus is handled three times with the cranes. As the sand is handled one to three times, it is evident that somewhere between 1000 and 1500 tons are handled every day.

The cranes, which are operated by both men and women, have served in this rigorous work for several years with need of only minimum maintenance.

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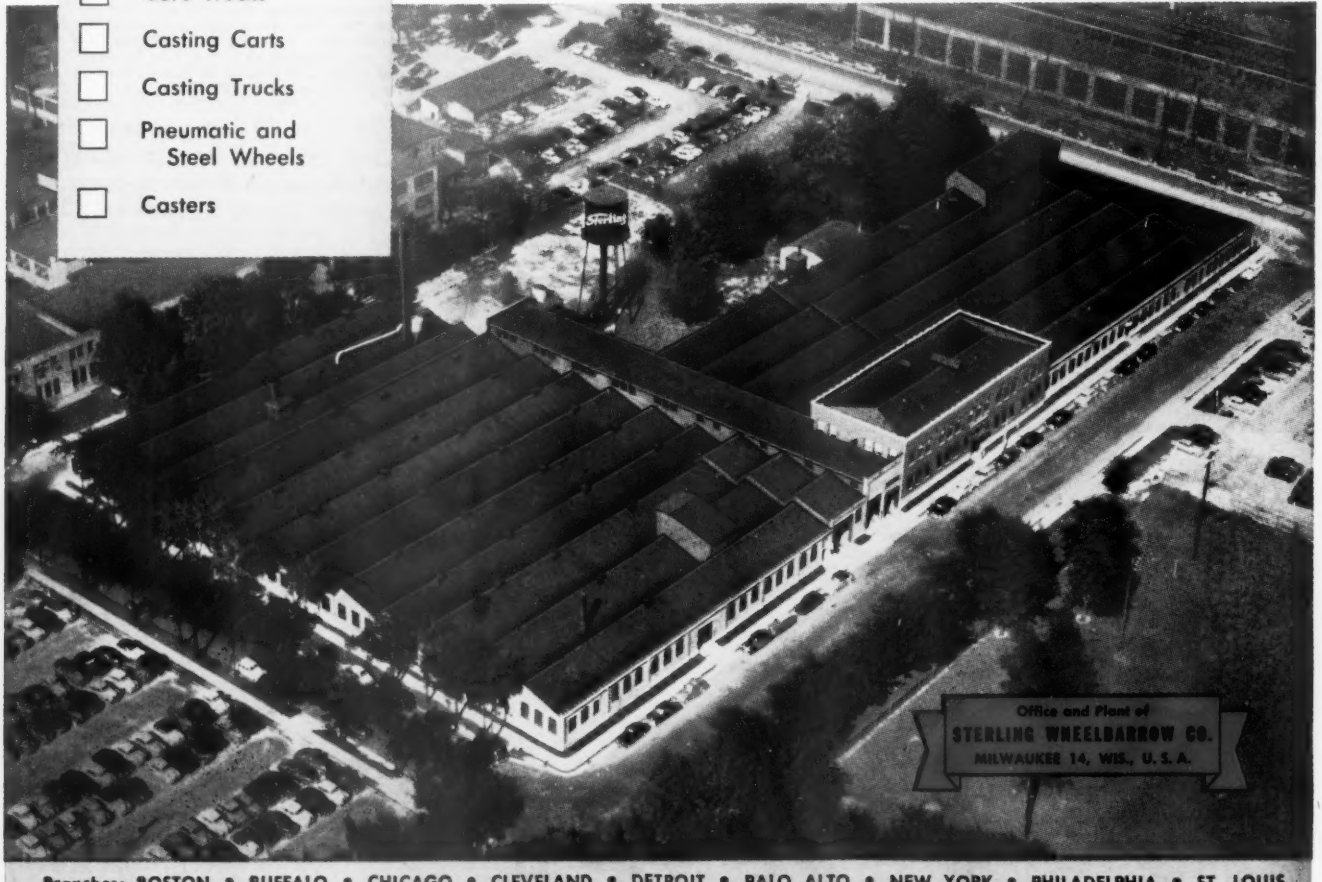

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Can You Meet Specs?

Buying habits of users of castings are changing. Customers are becoming more demanding about the components they order from foundrymen. Castings increasingly are being purchased on specification.

Specifications may be those provided by such organizations as the American Society for Testing Materials, Society of Automotive Engineers, American Railway Association, the federal government and numerous others. Or they may be developed by the purchaser to meet individual needs not completely covered by the accepted specifications in the field.

The reason for this trend is quite apparent. Castings are being called upon to perform more exacting jobs than ever before. Progress in the foundry industry has resulted in new types of cast metal, functional use of alloys, increased dependence on heat treating process and many other improvements in practice and product which have resulted in a wide range of both ferrous and nonferrous metals in cast form. These may vary widely in strength, elongation, ductility, surface finish and many other properties. To get just the right properties for the particular application, buyers of castings are purchasing more on specification.

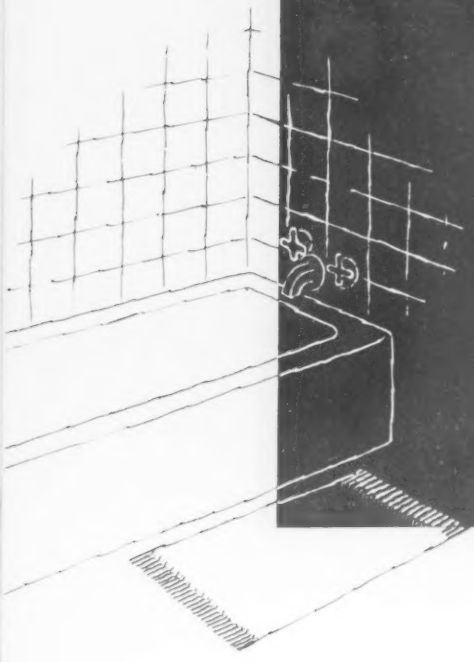
Selling on specification presents foundrymen with both opportunities and problems. On the plus side it takes the product out of the batch tonnage class and puts it into the field of an engineered component. It enlarges the casting market by indicating the ability to compete with components produced by other forms of fabrication. It stresses the variations in cost of various classes of castings and emphasizes the importance of price differentials which return the cost of production plus a fair profit.

On the other hand, if the specifications are to be met and customers satisfied, quality control must govern all production processes. Variables in practice must be eliminated. Raw materials and supplies used by foundries must be of high quality and uniform from shipment to shipment. Foundry equipment must contribute to the elimination of variables, and if the needed types are not available, new equipment to do an even better job than at present must be developed.

Specification buying of castings offers great opportunities to the progressive foundry. Foundrymen, as well as manufacturers of foundry equipment and supplies, have a stake in helping to meet the challenge it imposes.

Frank G. Steinebach
Editor

Highly Mechanized Line Produces Enamelware Castings



Large-volume production of high-quality bathtubs is achieved at the Chattanooga, Tenn., Division of Crane Co. by a highly mechanized line for the molding, pouring, shaking out and cleaning of large, enamelware castings

By WILLIAM G. GUDE
Managing Editor

ALTHOUGH the bathtub is a boon to mankind, it can represent a number of problems for the foundry attempting to cast it. And these problems multiply rapidly when large-volume production of a uniformly high-quality tub is sought.

A good example of how an efficiently engineered plant layout can be combined with foundry skill to mass produce this casting with a minimum of rejects is provided by the Crane Co. at its Chattanooga, Tenn., Division.

Crane's original plant in Chattanooga was built in 1921 and was known as the Crane Enamelware Co. The following year it acquired the assets of the Cahill Iron Works, which had been supplying Crane Co. with enamelware.

Production of enamelware was discontinued during the war, but with the postwar resumption of operations on civilian goods the company set about modernizing certain of its facilities. Chief of these improvements — and the one with which this article is concerned — is a highly mechanized line for the molding, pouring, shakeout and cleaning of large enamelware castings.

For a number of years Crane manufactured boilers and radiators at plants in Bridgeport, Conn., and North Tonawanda, N. Y. These plants were sold during the war and operations were transferred to Chattanooga in 1945. The company now has three separate gray iron foundries there, one for production of boiler castings, one for radiator castings and the third for enamelware. While bathtubs are the principal product of the enamelware foundry from a tonnage standpoint, the plant also produces a corresponding number of lavatories and sinks. Popular taste in the basic concept of bathtubs has changed relatively little in recent years. There is a moderate demand for the square type unit, but the principal choice is for the conventional five-foot built-in tub. Both longer and shorter units, however, are available. Incidentally, the pressed metal tub never has seriously threatened the popularity of the cast product where quality and service are major considerations.

Design Causes Complications—The modern tub incorporates an apron which gives it a vertical exterior side when installed. This apron, causing an off-set parting which requires the use of specially shaped flasks, is only one of several factors complicating the casting of the tub. Section thickness of the casting is only about $\frac{1}{4}$-in.; this makes it mandatory that patterns, flasks and molding equipment produce an accurate mold cavity. Lack of uniformity in section thickness would tend to cause warping when the tub is heated during the subsequent enameling process.

Another important requisite is an efficient gating system which will permit the metal to flow quickly through the relatively narrow mold cavity and over a sizable area of green sand without causing cold shuts. Finally — but highly important — the casting surface must be free of imperfections that would prevent it from taking and holding a durable coating of porcelain enamel. In the final analysis, eye appeal ranks with utility as a selling point for this product.

System Is Compact — Layout of the new tub

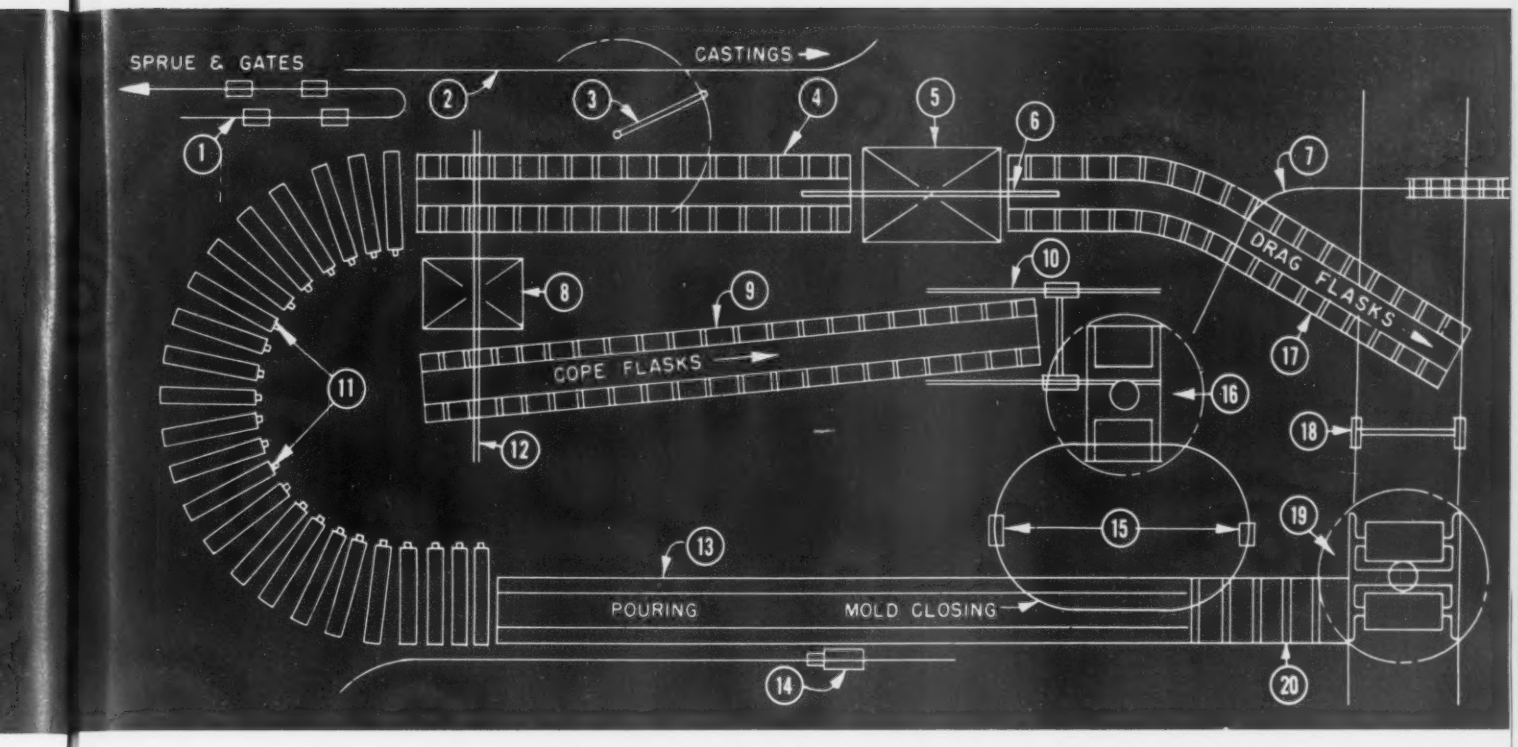


Fig. 1—Layout of mechanized molding system at Chattanooga Division, Crane Co.

1. Sprue conveyor
2. Cooling conveyor
3. Jib crane
4. Gravity roll conveyor
5. Drag shakeout
6. Monorail hoist
7. Pattern monorail
8. Cope shakeout
9. Gravity roll conveyor
10. Crane
11. Powered roll conveyor
12. Monorail hoist
13. Walking beam conveyor
14. Pouring ladle
15. Mold closing hoists
16. Cope molding machine
17. Gravity roll conveyor
18. Crane
19. Drag molding machine
20. Powered roll conveyor

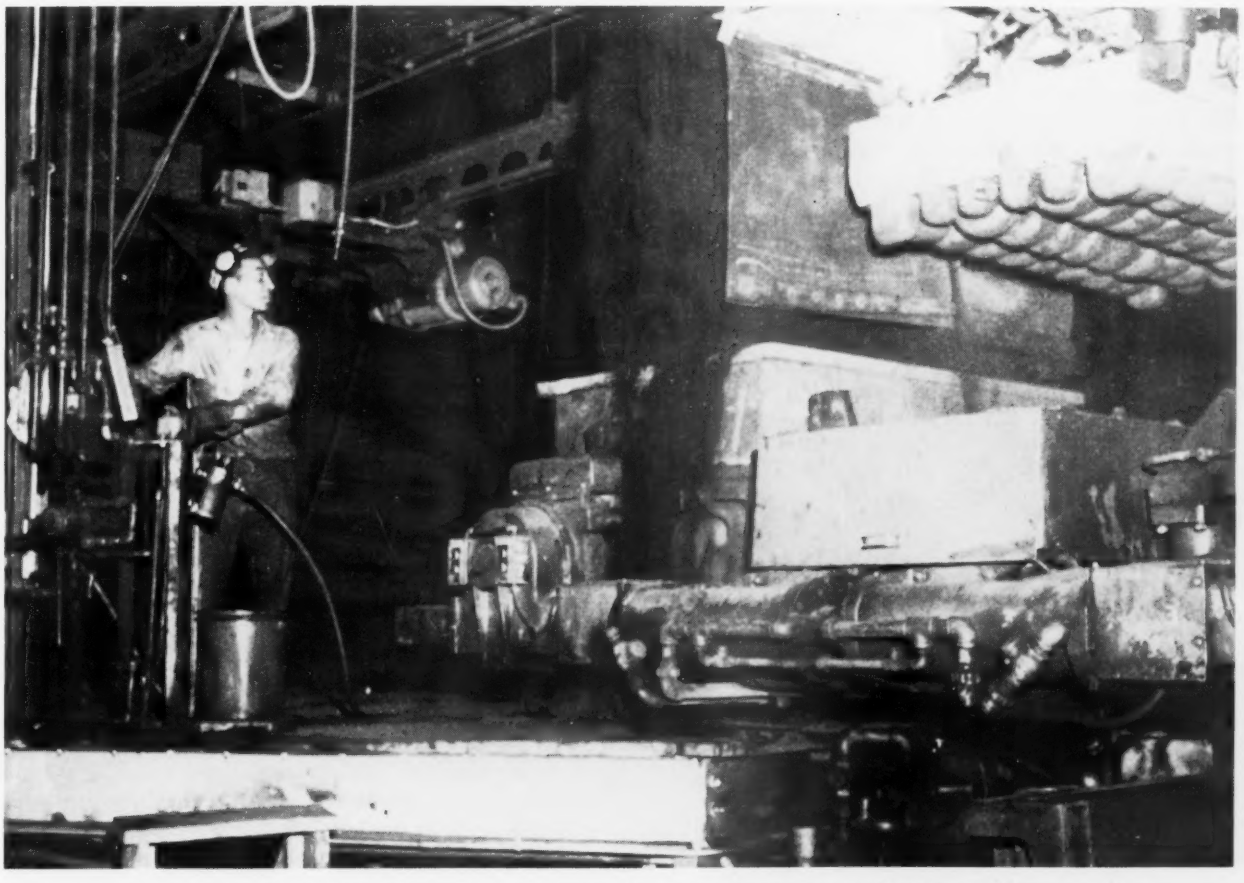


Fig. 2—Filling drag flask with sand at a two-station indexing molding machine

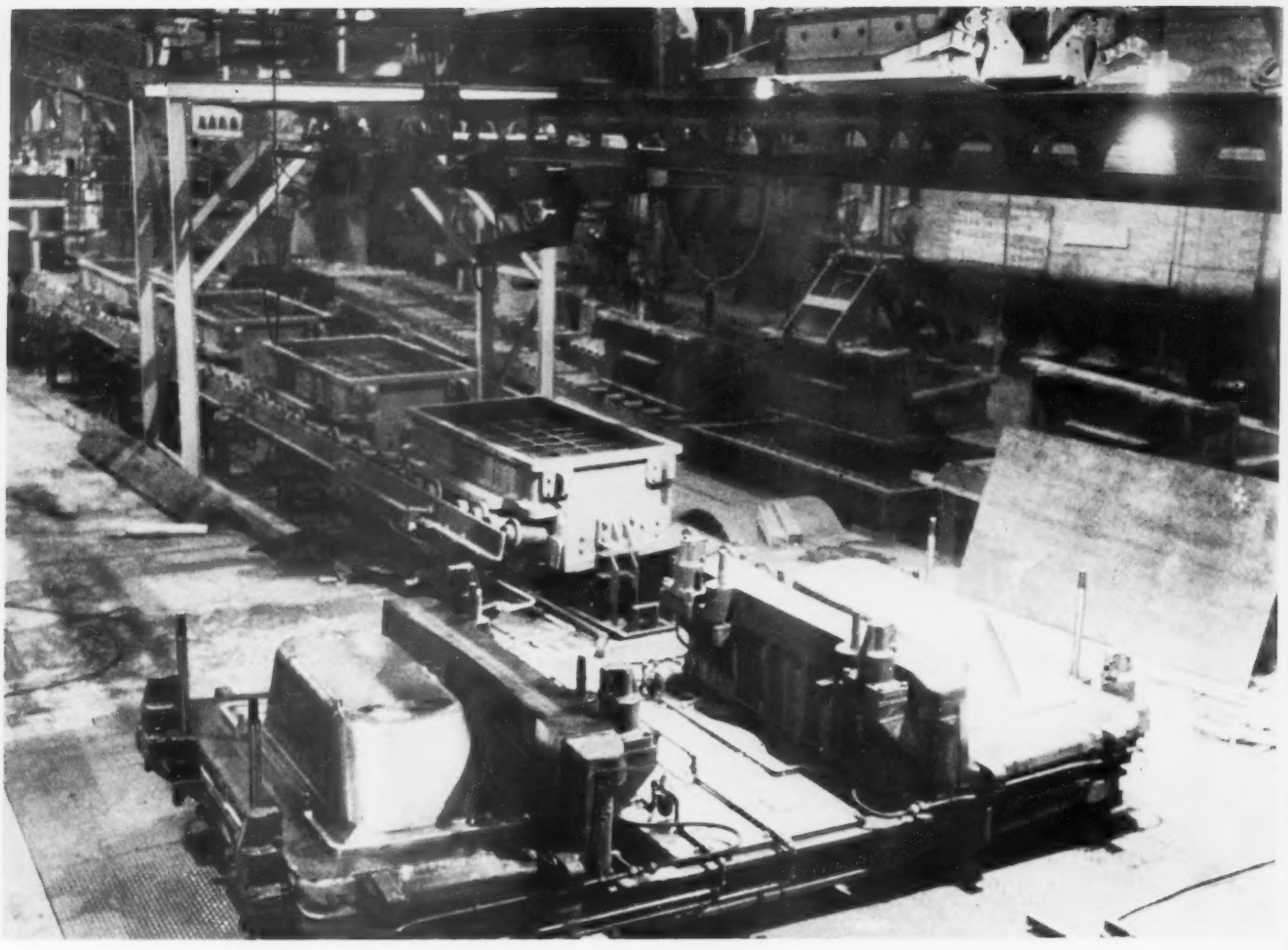


Fig. 3—Cope molding machine with cope flask return conveyor at left, drag at right

molding system and the principal items of equipment involved are shown in Fig. 1. The area occupied is approximately 50 x 120 ft, and the system produces 55 to 60 molds per hour with a crew of about 20 men. All of the equipment necessarily is of rugged construction, for while a 5-ft tub weighs slightly less than 300 lb, its size requires large flasks, molding machines and handling facilities. Flasks are heavy cast iron and cast steel. The drag flask has an extension on one side to accommodate the tub apron, and the cope flask has a corresponding recession, as may be seen in Figs. 6 and 7. Both flasks are fitted with bars, and are machined accurately to provide a close fit that will eliminate shifts.

Essentially the molding system consists of a pair of cope and drag machines, two shakeouts, and a variety of handling equipment. Roller conveyors — including walking beam, gravity and powered types — cranes and monorail hoists handle empty flasks and molds. Hot metal is delivered over a monorail, and chain monorail conveyors move out castings, gates and sprues when the molds are opened.

The flow of molds, flasks and castings is indicated in Fig. 1. As a drag flask moves over its return gravity roll conveyor it comes under a bridge crane (18). (Note: All figures in parentheses refer to Fig. 1.) When the flask is picked up by its trunnions, it rolls over and is moved to the jolt station of the drag molding machine (19). This unit and the cope machine are Herman two-station indexing molding machines. Each employs two patterns, permitting one mold to be rammed while the pattern is being drawn from the other mold. Flasks are rammed solely by jolting.

Drag Molding—The drag flask is lowered by the crane onto the jolt machine after the pattern has been indexed into position. Pressing a button clamps the flask to the pattern, automatically fills the flask with sand from an overhead hopper (Fig. 2) and starts the jolting operation. During the jolting, ramming weights (upper right, Fig. 2) are moved over the flask. Jolting is interrupted momentarily as the weights are lowered, then resumed. These weights help to provide desired sand density in the upper half of the mold.

After the jolting operation — requiring a total of about ten seconds — the ramming weights are removed and the pattern and flask are indexed to a pattern draw station. During this indexing, the pattern and flask are being rolled over and the other pattern is being placed in position at the jolt station. The mold is drawn downward from

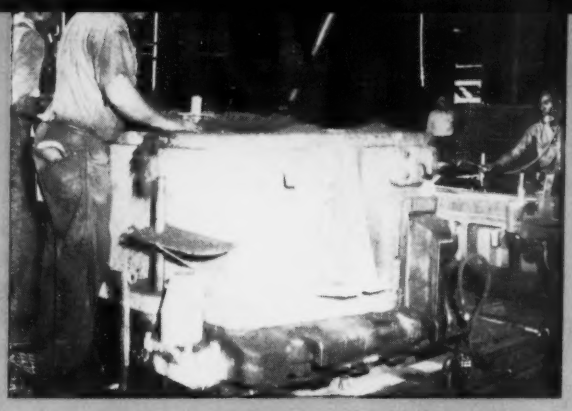


Fig. 4—View of a cope mold being jolted. Mold is stripped at the opposite station

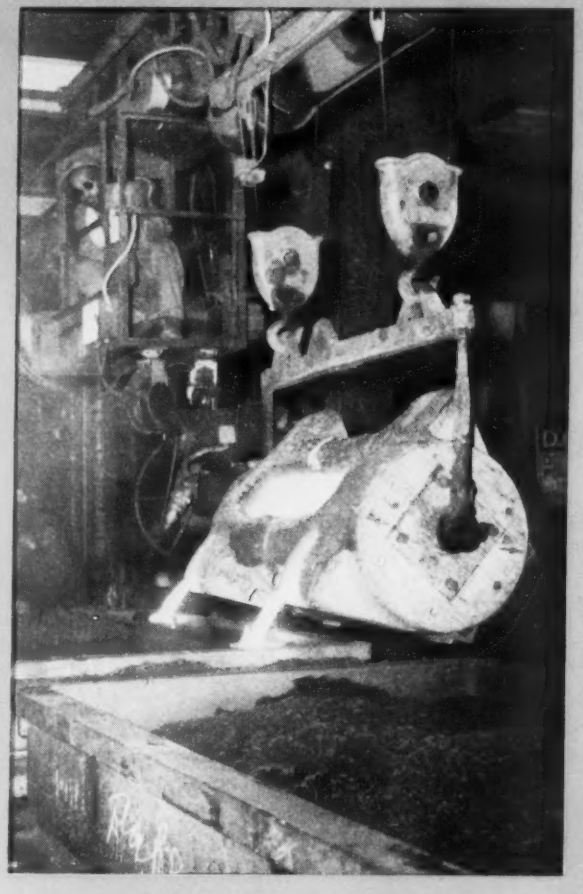
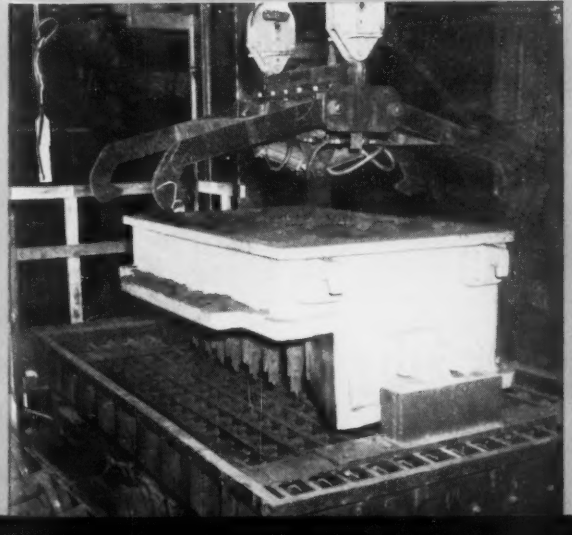


Fig. 5—Pouring a tub casting through two sprues. Hot metal is delivered by monorail

Fig. 6—Cope mold on vibrating shakeout. Grab places empty flask on return conveyor



the pattern and deposited on a powered roller conveyor, which moves it to the mold closing station.

Cope Molding—Meanwhile a cope is being rammed at its jolt indexing machine — (16) in Fig. 1. This unit also is shown in Fig. 3. A cope flask arrives at the machine over a gravity roll conveyor (9), is picked up by a crane (10) and deposited on four raised stripper pins at the jolt station. The flask is released automatically from the crane and the stripper pins lower it onto the pattern. Operators set two sprue pins, and press a button to fill the flask with sand, start the jolting action and operate clamps holding the flask to the pattern. After an eight-second jolt, the sprue pins are removed and the pattern and mold are raised and indexed around to the stripping station. At this station four push-off pins raise the mold off the pattern. While this stripping operation is performed, another mold is being rammed at the jolt station.

The completed cope is picked up by a hoist (15) which travels on an elliptic monorail. Two hoists are employed in mold closing; while one is moving a cope mold from the stripping station, the other is engaged in closing a mold. As a closed mold is moved onto the walking-beam type roller conveyor, another drag takes its place to await the matching cope. The completed mold flask is clamped and poured on this conveyor (13), as shown in Fig. 5.

A ladle of hot metal (14) is brought to the pouring station over a monorail by an operator-driven carrier. This ladle has two pouring spouts 38 in. apart to match the two sprues. The tubs are cast top down, and the sprues, located at one side of the mold, lead to runners which follow the outline of the tub rim. Numerous gates feed metal from the

Fig. 7—Removing tub casting from drag. Crane transfers casting to cooling conveyor at right background

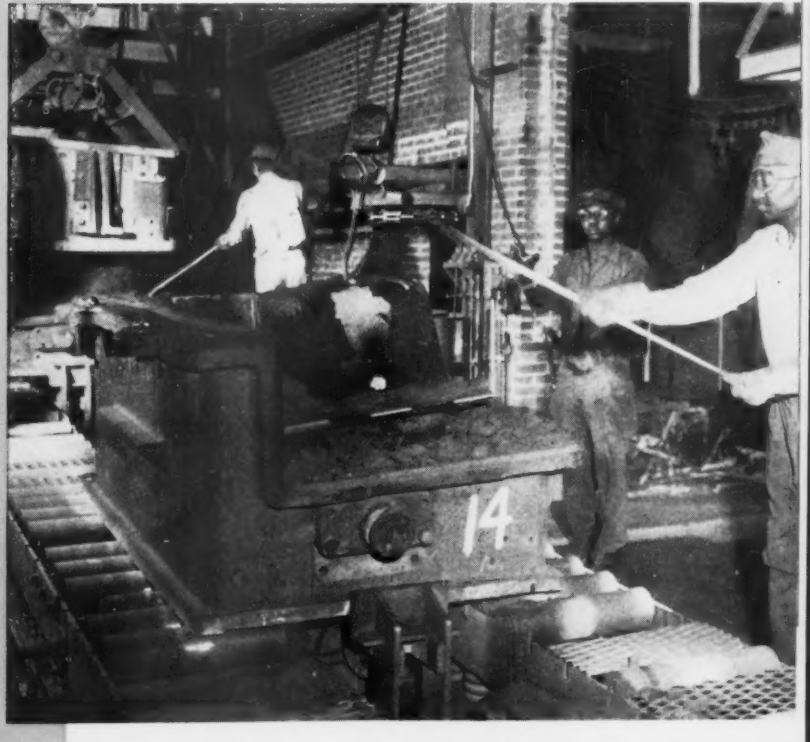


Fig. 8—Castings cool for 2½ hours traveling on monorail chain conveyor

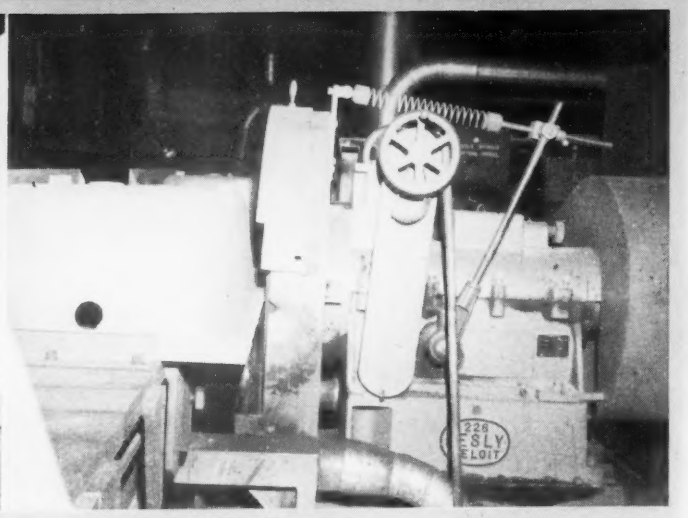


Fig. 9—Conveyor moves shotblasted tubs past machine to grind side rim

runners to thin sections of the mold cavity.

Solidification Is Rapid—Because the casting is of thin section, the metal solidifies rapidly. Consequently, only about eight minutes' cooling time is required before the mold can be opened. Poured molds reverse their direction of travel on a powered roller conveyor (11) after the flask clamps first have been removed. As the molds come off this live conveyor, they move onto a gravity roller conveyor (4). The cope is removed by a grab suspended from a monorail, carried to a vibrating shakeout (Fig. 6) and from there moved to the return cope flask conveyor (9). Meanwhile the sprues, runners and gates are removed and placed on trays of a chain monorail conveyor (1) for return to the melting department.

A jib crane (3) is used to lift the tub casting from the drag and transfer it to a hook of the chain monorail conveyor shown in the right background of Fig. 7. This conveyor travels outside the foundry (Fig. 8), and after about 2½ hours the cooled casting arrives at the cleaning room. The drag flask continues down the gravity roll conveyor, is picked up by a monorail hoist (6), placed on a vibrating shakeout (5) and then continued on the return conveyor (17) for eventual reuse.

When it is necessary to change patterns or flasks, they are placed on a roller conveyor to which both the drag flask handling crane (18) and a monorail hoist (7) leading to the cope molding machine have access.

The casting cooler conveyor leads past another section of the foundry where other enamelware castings are produced. Molds for these castings are rammed by sandslinger on a turntable, Fig. 12, and the castings are delivered to the cleaning room by the monorail conveyor serving both the tub molding systems.

Cleaning Operations Mechanized—In the cleaning room the castings are transferred to the chain conveyor of a continuous airless blast cabinet. After leaving this cabinet the tubs are placed top down on a slat conveyor which moves them past two edging machines. These machines grind the ends and side of the tub rim, as shown in Figs. 9 and 10. They are then transferred to individual dollies of the type shown in Fig. 11 and pushed to brightly illuminated and well ventilated rooms where operators use portable grinders to smooth off any surface imperfections.

Next step is the enameling operation. This involves first the application of a ground coat to prevent oxidation when the tub is heated in a furnace to 1640-1700°F. Powdered porcelain enamel is applied by hand from a vibrating sieve, and the tub is returned to the furnace between applications for the coating to fuse. Final inspection and crating complete the production process.

Sand Control Important—Careful control of the molding sand is a requisite in production of these castings. The sand used is a Tennessee natural bonded type of 76 AFS grain fineness. Permeability is 90 and moisture is held at 3.5 per cent. Sand analysis is checked each half-hour. No carbonaceous materials are added to the sand because of their adverse effect on the ability of the casting surface to be enameled successfully.

Three mullers supply sand to the molding system, the sand being transferred by overhead conveyor belts to bins located above the cope and drag machines. These bins hold 5 to 6 tons each. Sand from the two shakeouts travels by underground conveyor belts to a bucket elevator which raises it to storage bins above the mullers. The system contains about 250 tons of sand.

Hot iron is provided by three cupolas, two of which are operated at a time. The cupolas, lined to 72 in., melt about 175 tons each in eight hours and are tapped continuously at 2800°F into a 10-ton-capacity electric furnace. The latter serves as a holding unit. Castings are poured at a temperature of 2780°F.

While strength of the iron is not an important consideration, its chemical composition can affect fluidity and enameling properties and therefore is closely controlled. The aim is to maintain low manganese, with approximately this composition: 3.30 total carbon, 2.60 Si, 0.70 P and 0.08 S.

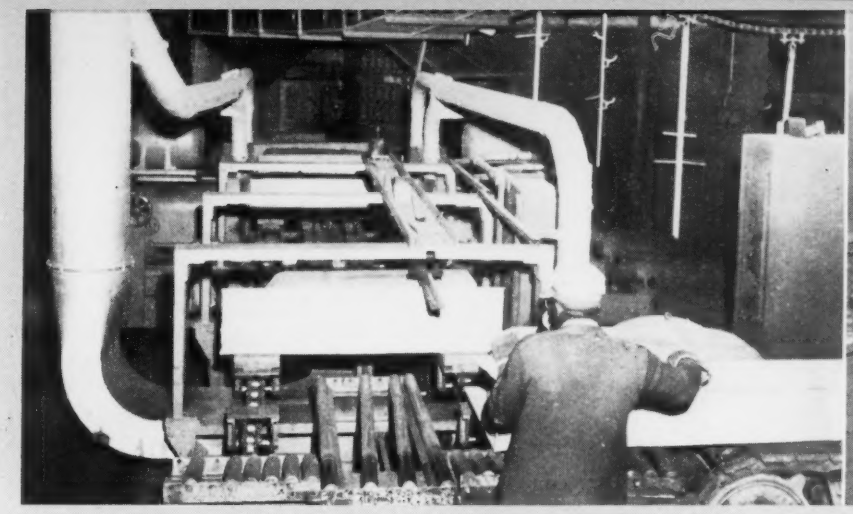


Fig. 10—Second edging machine is to grind ends of the tub rim and apron

Fig. 11—Final grinding operation is touching up with a portable grinder

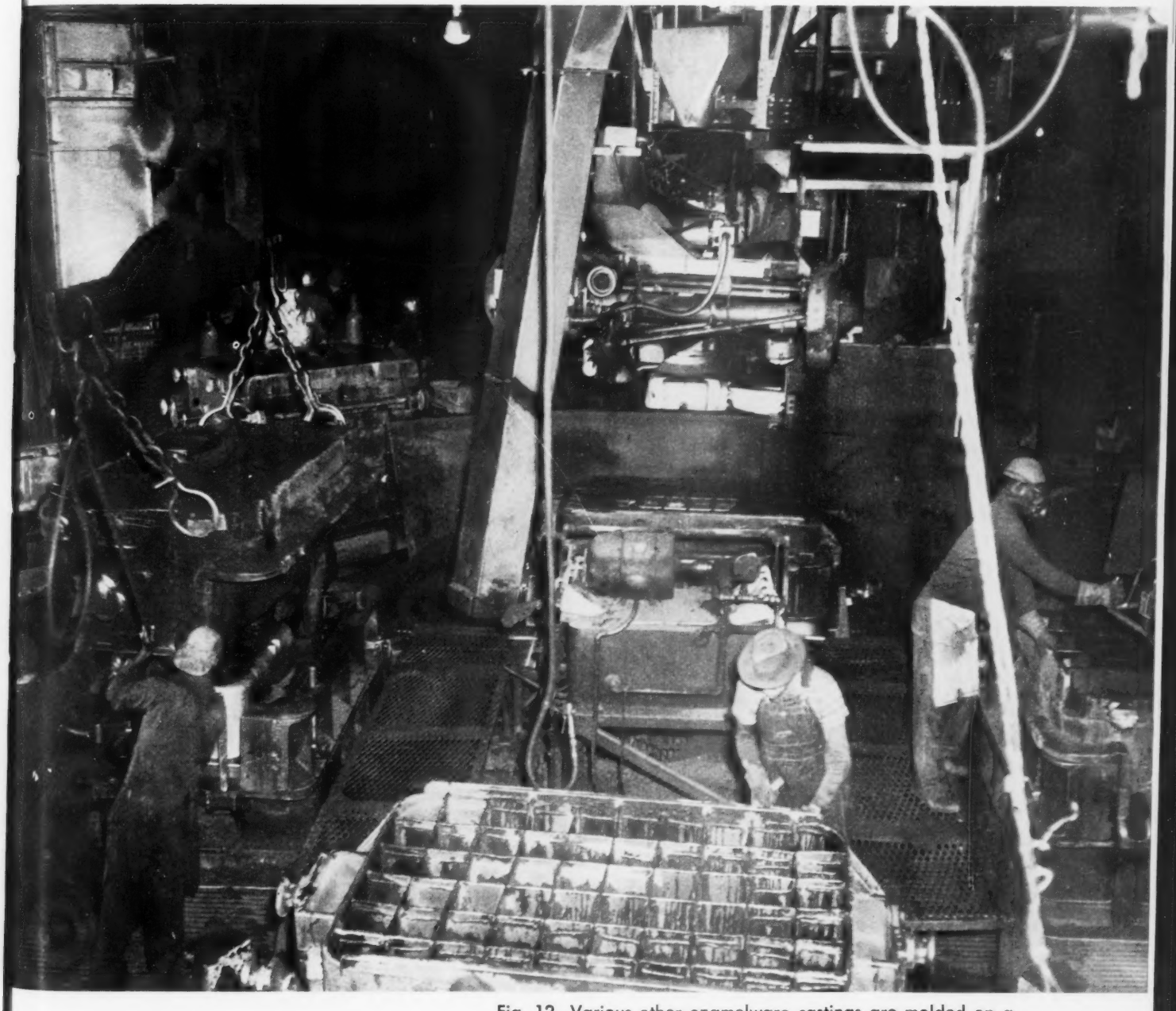
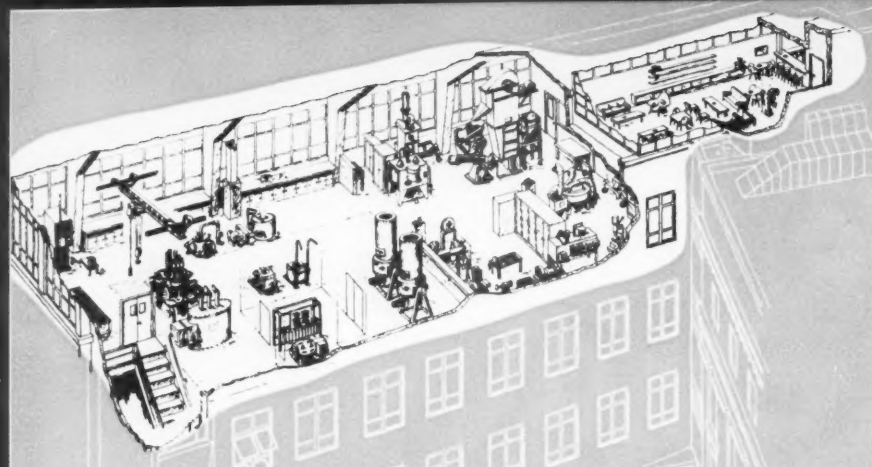


Fig. 12—Various other enamelware castings are molded on a turntable by sandslinger in another section of the foundry



Foundry Teaching and Research at MIT

By HOWARD F. TAYLOR
Professor, Department of Metallurgy
Massachusetts Institute of Technology
Cambridge, Mass.

This article describes what is done in foundry teaching and research at Massachusetts Institute of Technology. Foundry laboratory layout is shown at the upper left. At right of laboratory is the William B. Given Jr. Lounge

DURING the last several years an acute shortage of trained men has developed in all branches of science and engineering. Science, technology and the country's economy have advanced so rapidly that the demand for trained men greatly exceeds the supply, and concern for the future is being expressed in Washington and by institutions of higher learning. Curricula are being changed and faculties being expanded to meet the challenge.

Nowhere is the need greater for trained men than in the foundry industry. Relatively speaking, this branch of basic industry has been the most backward technologically and is the very last to turn to the engineer and welcome him into its ranks. The last few years have seen several hundred trained engineers absorbed into the foundry and allied pursuits, and the complexion of the foundry industry is changing from an art and a craft to a technically controlled operation — although the change is slow, it is sure.

Much credit for this change must go to the Foundry Educational Foundation whose officers and board of directors originally visited the campuses of Case, Northwestern, Cornell, Wisconsin and Massachusetts Institute of Technology and encouraged these schools to include foundry engineering subjects in their curriculum. In return for this consideration the Foundation offered scholarships, financial aid for teaching and equipment, and assisted in every way possible to bring industry and student together in summer and permanent jobs. This program has worked so well that today the number of FEF schools has increased several fold with financial limitations on

Photos and sketches by George Schmidt

the Foundation being the only deterrent to still more listings.

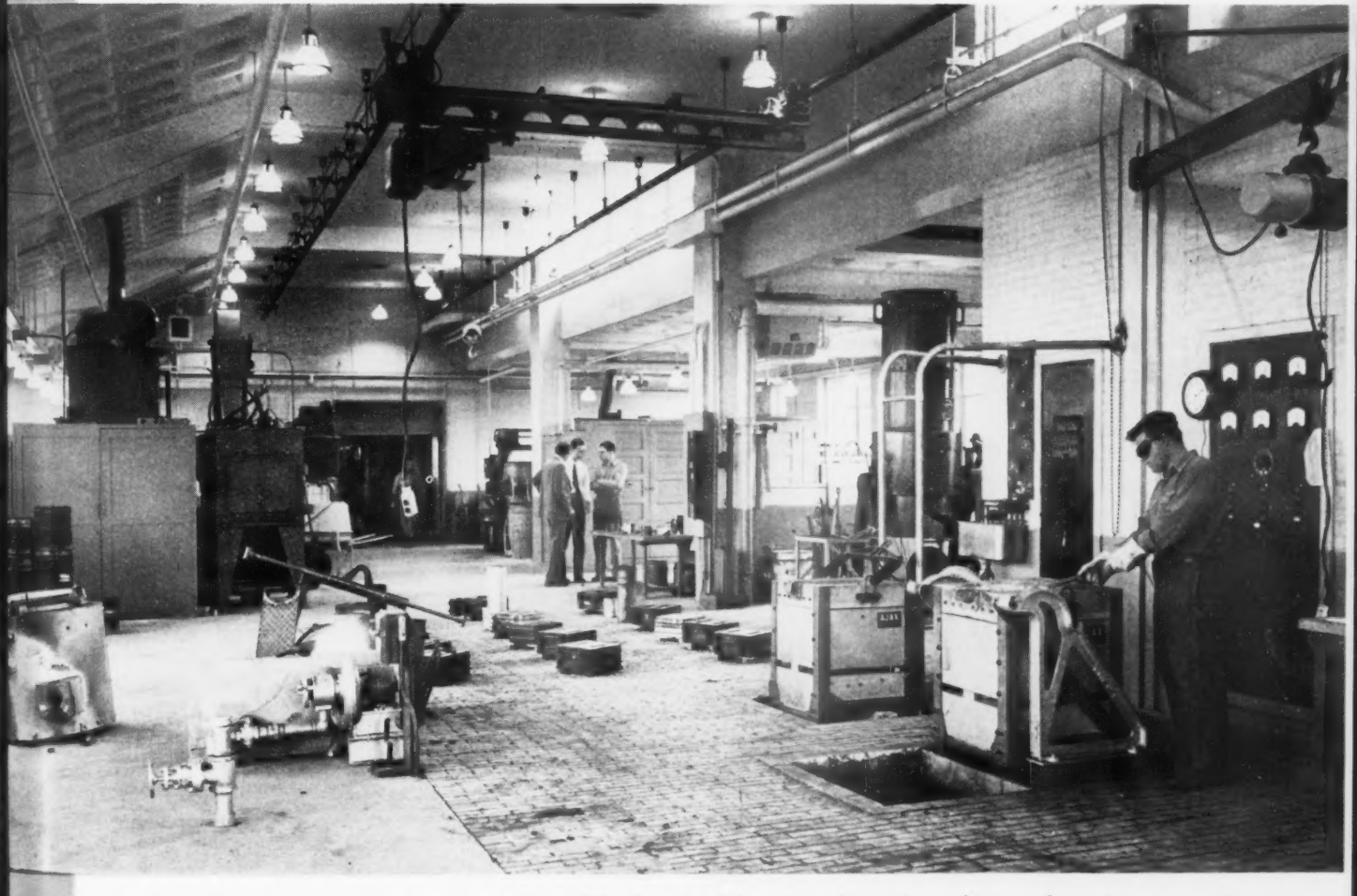
At MIT, foundry training—as it has come to be known on the campus today—began in 1946. That year the FEF issued a grant of $15,000 for undergraduate scholarships and agreed to underwrite a gift of $20,000 for purchase of an induction furnace and other basic equipment. The same year the Steel Founders' Society of America made a grant of $15,000 for two fellowships and purchased an electric arc furnace and other miscellaneous foundry equipment worth $25,000. MIT then matched these gifts by an appropriation of $35,000 for installation of equipment and provision for electrical power. This was a sacrificial appropriation because it was known a similar amount would have to be appropriated three years later when the new Metals Processing Building was ready and all the heavy equipment would be moved and reinstalled. It reflected the desire of MIT to serve basic industry within the dictates of sane academic policy.

The many gifts of money and equipment by the foundry and allied industries over the next few years are too numerous to mention individually; suffice to say these contributions, large and small, provided MIT a completely equipped foundry laboratory with essentially the facilities that exist today.

Scholarships and fellowships, lively and progressive research, adequate equipment, and the natural fascination of molten metal all combine to insure healthy student interest. Of these, scholarships and fellowships, and the fascination of molten metal, are by inference most important because student interest was high from the outset before the plant and research potential were established. The earliest, most encouraging sign of student enthusiasm was spontaneous formation of a student chapter of AFS and creation of the so-called MIT Experimental Foundry Group.

The functions and activities of a student chapter of AFS are well known; the Experimental Foundry Group is a student-conceived and student-run organization of as many as 15 to 50 boys (and four or five girls over the years) who meet on Saturdays to operate their concept of a modern foundry using the school's facilities. In the early days men reported as early as 4:30 a.m. to prepare the cupola for use; today things are organized more efficiently and this is not necessary. The men make molds (sometimes make their own patterns), melt and pour metal, clean castings and, in short, do a complete foundry job; all without pay or academic credit.

Strange as it may seem, metal casting competes quite favorably with extracurricular sports. The chief ingredients of such interest are 1) encouragement, 2) facilities, and 3) an atmosphere in



View of the foundry laboratory shows the melting and pouring area. A heat is being melted in the 300-lb high-frequency induction furnace

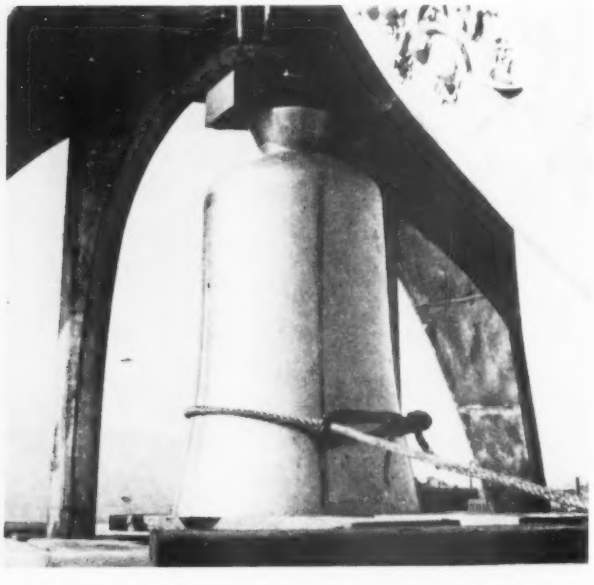
which the students can work without fear of reprisal for breakage or failure to clean up the last grain of sand after their day's work. It has proved helpful to have a staff man as advisor to the group who is willing to spend a few Saturdays and an occasional evening meeting with the group. Paul Hughes is the man at MIT.

A surprising feature of foundry training at MIT has been the type and calibre of men attracted to metal casting as a potential career. It might be expected to appeal to men with low or medium grades because of the implied grass roots nature of the industry; actually, most men have come from the top or upper quarter of their class.

This enthusiastic (potentially overenthusiastic) response was an early cause for concern; it seemed probable the foundry industry might not be ready for this degree of interest, and might not absorb such high-calibre bachelor, masters and doctorate men. In some respects this concern is still a very real one, for the industry has yet to react fully under poor business conditions. There is some evidence the industry will have to study how best to utilize engineering talent to the end that the engineer remains enthusiastic and happy in his environment and the companies get the very most from their investment. Experience to date is encouraging, however.

It is axiomatic that little is ever accomplished without enthusiasm and effort. Fortunately the men who teach foundry classes and supervise theses and research are more than adequate in both departments. Profs. Charles C. Reynolds, Merton C. Flemings Jr., Mr. Paul Hughes and the writer comprise the current foundry teaching staff; Professor Adams, who taught foundry at MIT for years is now in charge of welding but maintains a healthy interest in his first love, foundry.

Donald J. Reese, of International Nickel Co., is a lecturer at the Institute and is a source of inspiration to students interested in cast iron and cupola operation, as well as in foundry affairs in general. The foundry work has the active interest and support of Prof. John Wulff, head of the Metals Processing Division, and Prof. John Chipman, head of the Metallurgy Department, who have both long been champions of teaching and research in cast metals.



Chapel bell cast in MIT's foundry laboratory is of 20% Sn-80% Cu alloy and weighs about 1300 lb

Foundry Content in Engineering Training at MIT

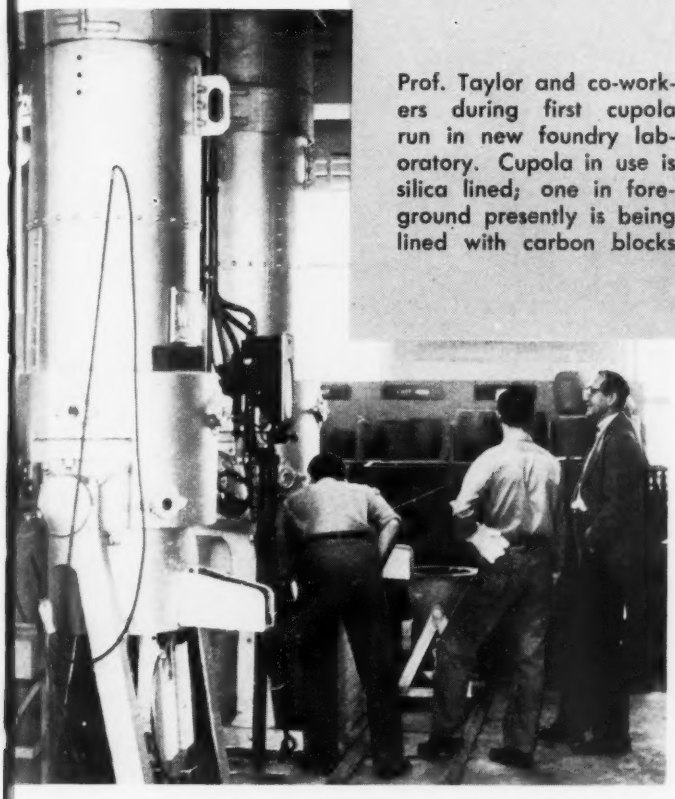
Undergraduate Level—Training in metal casting at MIT is done with elective courses for the undergraduate, and at postgraduate level. A student can start a career in foundry work as a freshman, but usually such specialization is decided upon by the junior, senior or graduate student. Only two courses are required for undergraduates. *Engineering Metals* is essentially a course in metallurgy for engineers which includes a laboratory in metalworking, metaljoining, powder metallurgy and metal casting and demonstrations of metallurgical phenomena.

The alternate course, *Metals Processing,* is a laboratory course for junior metallurgists in which students spend five weeks each in foundry, welding and metalworking. In both undergraduate courses, during the five weeks in metal casting, each individual student mixes sand, makes molds and cores, melts metal, and cleans and keeps his own castings. The student spends more time on the actual processes of metal casting in the latter course; a three-hour laboratory for five weeks, with homework and reading, provides a good foundation. This is certainly sufficient time to accomplish two objectives—to teach future designers and consumers of castings the intrinsic economic and engineering advantages of castings and to create in them a proper engineering perspective toward castings, and to inspire interested students to elect other advanced foundry courses.

Undergraduate elective training in metal casting is relatively more extensive than the required training; this is understandably dictated by the philosophy of engineering education at MIT where students are purposely not trained narrowly for any field of specialization, ample time being provided in elective courses for students to specialize in certain specific fields of interest. The undergraduate foundry courses a student may choose as an elective are 1) Foundry Engineering, 2) Senior Thesis, and 3) Special Problems.

Foundry Engineering is a full-term, formal course dealing generally with all aspects of the cast metals industry and specifically with the areas which can be reduced to more technical treatment. An attempt is made to deal briefly with human problems encountered in the cast metals industry as well as with technical aspects; the cast history, laboratory, and theoretical approaches are combined in an attempt to provide a "feeling" for the foundry as a profession, as an art, and as a science.

In general, foundry practices and the major metallurgical and engineering problems encountered in industry are accentuated. The students have adequate grounding in basic sciences and an early orientation with the problems met by a



Prof. Taylor and co-workers during first cupola run in new foundry laboratory. Cupola in use is silica lined; one in foreground presently is being lined with carbon blocks

foundry engineer gives the advantages of 1) knowing what the important problems are and 2) having a chance to apply scientific principles to solving these problems in a fully equipped laboratory while still in school and not beset by production responsibilities.

Undergraduate Thesis can be elected by seniors in any phase of metal casting. The subject of the work is determined chiefly by the student's particular interest, and every attempt is made to accommodate the student's choice. If no special subject is preferred or predetermined, several possible choices are outlined in detail, and usually the student discusses several before selecting one. The thesis is considered an important part of the senior curriculum so the subject is carefully chosen; usually the student becomes so interested he spends far more than the time dictated by academic requirements.

A *Special Problem* course can be elected in foundry by an undergraduate with permission of his registration officer. It is very simply an arrangement with the instructor as to subject matter and credit hours, and is a means for increasing the amount of elective time in a chosen academic pursuit. The program can be in the laboratory or can be library or theoretical work. By taking two terms of Special Problem work and a thesis, the student can manage to spend a lot of time in his chosen field.

The MIT Experimental Foundry Program has proved to be a very effective extra-curricular means for inspiring students to work in the cast metals field and for effective training. This must be included under Foundry Training available to the undergraduate even though it does not appear in the curriculum.

The undergraduate training described above is available to all students at MIT. To date the groups most attracted to Foundry have been mechanical engineers, metallurgists, and business and engineering administration students. This is also true for graduate training.

Graduate Level Training—This type of training available includes master of science and doctor of science thesis work, advanced special problems, and training in research and teaching at the ranks of assistant professor, research assistant, teaching assistant, and staff employee. Nearly all doctoral candidates first obtain their master of science degree, although this is not a rigid requirement. All undergraduate courses are, of course, available to graduates transferring from other schools, or to those not having taken them during their undergraduate courses at MIT.

Most graduate students in foundry work are engaged in one or more of the foundry research programs. Under certain conditions, as in the case of research assistant, this work can be used as thesis material. Besides providing financial aid for students, the research program insures lively, up-to-date projects and helps to obtain and maintain excellent equipment for student use. The annual research budget for industrial and government research in foundry at MIT approximates $160,000 per year. All of the research results are publishable as no secret or confidential work has been accepted to date.

Every possible attempt is made to keep relations as informal as possible, particularly at the postgraduate level. This is not so practical at the undergraduate level where greater numbers of students must be accommodated in lecture and laboratory groups, but it is the rule whenever possible. Because of the relatively less regimented technical status of the foundry industry, as compared with other industries, a very definite effort is made to give postgraduate men a broad grasp of the field; sometimes at the expense of more narrow, specialized training.

Men doing research, whether students or not, are constantly brought into direct contact with visitors from industry or other laboratories; more often than not, these researchers will be the main contact acting entirely for the supervisor. This has been found to provide great breadth and to breed much confidence in students. Men from the foundry industry generally do not realize how important this contact is—both from their and the students' viewpoint. If they did, more ambassadors of the foundry industry would visit the campuses across the country at frequent intervals.

The above sequence of courses, although mostly elective, provides means for a student to obtain several years' intensive training in foundry. Several students have completed as much as six years of specialized training before entering industry with their master's or doctor of science degree.

The so-called "foundry program" at MIT is a

Basic research program on bonding action of clay is being conducted in this modern sand laboratory. Routine tests of the foundry also are made here

mythical sort of thing. There is no "foundry course" as such and no one graduates as a "foundry engineer"; only a small fraction of the total foundry training available to a student is required to be taken in any undergraduate curriculum. The major portion is taken as elective subjects or theses. All enginering students are required to take one basic course which includes laboratory work made up of one-third each of foundry, metalworking and welding. They also must do a thesis which can, but need not, be in foundry. This is the least amount of foundry training an engineer at MIT can take. So far this has been enough to generate the interest needed to keep the elective courses adequately attended and to provide the graduate students that can be accommodated.

Foundry Research—Facilities, manpower and financial arrangements are very favorable for foundry research at MIT. The equipment, discussed in detail later, provides facilities for working in all cast metals except titanium. Small laboratory-size equipment as well as large shop size facilities are available. Many problems in the foundry lend themselves to small-scale, basic research techniques, but in others the problem is not yet clearly delineated scientifically and less fundamental approaches are needed. As an indication of range, charges of metal as small as a droplet can be melted in a 3-kva induction furnace and as large as a ton in the 3-phase electric arc furnace.

The manpower source is essentially inexhaustible, with nearly all the undergraduate engineering classes to draw upon. Foreign students and transfers are also a steady source of talent.

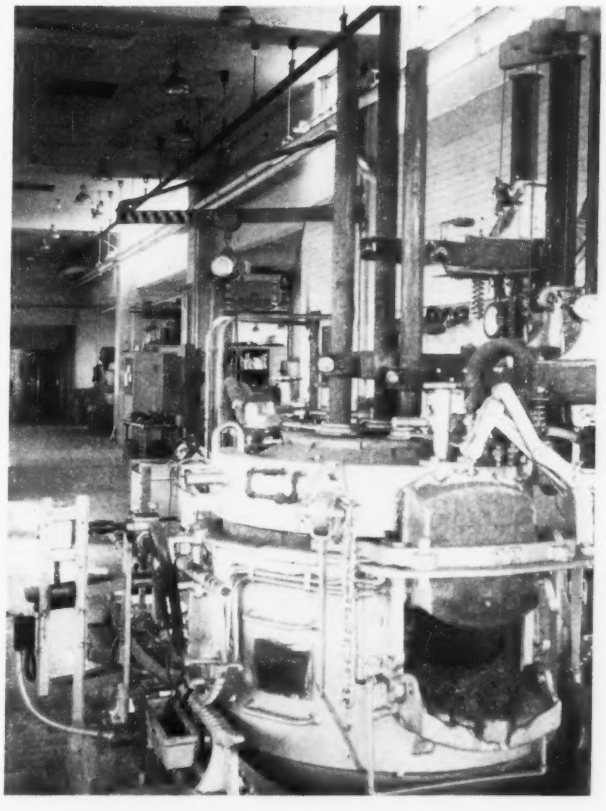
Research is done on three general bases. The Division of Industrial Co-operation at MIT will make research contracts with the government or industry in which the sponsor retains certain rights of patent and publication; this is done on the basis of an overhead charge on salaries and wages. The work is supervised by one or more professors using full-time help or using students on a part-time basis. The "grant-in-aid" is a form of sponsorship of research in which the donor gives up all patent and publication rights and may, or may not, specify the general research subject.

From the total educational value perhaps the best form of grant is the "research fellowship." The donor establishes a fellowship in his or his company's name, providing enough funds for the student's living expenses, his tuition, and an amount for research expenses which varies widely with different grants. In general, the student realizes about $600 per term plus his tuition which, at MIT, is $1100 per year. Some of the results of sponsored research have been published, a few are the property of sponsors, and some are as yet unpublished. Often a single, given project may furnish material for several publications, reports, and/or theses.

Facilities for Teaching and Research—In May, 1952 all facilities for teaching and research in metals processing were moved to a new building built with funds provided by Alfred P. Sloan, an alumnus (class of '95) and generous and long-time benefactor of MIT. The building is shared jointly by the Metallurgy and Mechanical Engineering Departments. The lower two and one-half floors are utilized by the Mechanical Engineering Department for metal cutting and machine tool facilities; the upper two and one-half floors house the metal processing (powder metallurgy, welding, metalworking, and foundry) facilities of the Department of Metallurgy. The foundry is located on the top floor.

Visitors to the campus never fail to ask why the foundry is on the top floor rather than in the basement. The answer is always the same—because 1) ventilation is less of a problem, 2) the cupola stacks do not run through other floors and take up needless space, and 3) everyone expects a foundry to be relegated to a basement; our idea was to be different. The arrangement has proved to be ideal in every respect; nonetheless people still find this orientation highly unusual.

The accompanying sketch and photographs are self-explanatory and serve to show the adequacy of the facilities for teaching and research. Only the basic sand handling equipment is in evidence and only one molding machine. This may seem too meager for teaching purposes but it has been found better to teach the principles of operation and demonstrate equipment by plant visits. This permits a better balance between teaching space and research facilities. Any value of equipment demonstrations that may be lost by not having one each of various types of machinery is more than made up by the knowledge gained from the solutions of basic research problems.



Closeup of three-phase electric arc furnace

An indication of the versatile nature of the foundry facilities at MIT is the recent casting of a fairly large bronze bell for the Institute's new chapel.

The chapel bell required about 1500 pounds of bronze bell metal for casting. The metal was melted in three separate furnaces and brought together into one large bull ladle. Baking molds and cores for this large casting and hoisting requirements created problems, but facilities proved adequate for the undertaking. The final casting was excellent in all respects, much to everyone's surprise, and is currently undergoing tests to determine its tonal characteristics.

The foregoing describes the status of foundry teaching and research at MIT, and the facilities available for the job. It might seem, at a time when the accent is upon reducing all technical knowledge to an equation of some sort, emphasis at MIT upon production problems of a basic industry, particularly one as unscientific as the foundry, would be a step backward. This is surely not the case. Metal casting, even the grubbiest aspects of the "art," has proved fascinating, rewarding and challenging to even the most "scientific" students or professors; the problems in metal casting have proved as complex and as challenging as those which are encountered in other phases of engineering.

Metal casting has responded well to the "scientific approach" and it is only a matter of time until the research man, scientist and engineer are as much a part of routine "foundry practice" as they are a part of most other industries. The foundry is fully as amenable to technical control of all phases of operation as any other business. The basic problems are not yet all clearly defined but this, too, is only a matter of time and effort. The emphasis on technology and engineering in foundry has grown rapidly in recent years and new developments are being made at an outstanding rate.

Essentially all equipment in the foundry laboratories at MIT is the gift of the foundry and allied industries, or has been purchased with funds provided by them or their representatives, such as the Foundry Educational Foundation and the Steel Founders' Society of America.

Although small gifts such as hand tools were as deeply appreciated as larger gifts, space prevents mentioning all donors; major contributors over the years are these:

Alfred P. Sloan, American Brake Shoe Co., Beardsley & Piper Division of Pettibone Mulliken Co., Boston Pulley & Shafting Co., Cooper Alloy Foundry Co., Doehler-Jarvis Division of National Lead Co., Exact Weight Scale Co., Harnischfeger Corp., Harry W. Dietert Co., International Nickel Co., National Engineering Co., New Jersey Silica Sand Co., Whitehead Brothers Co.

How To Deoxidize with PHOSPHOR

Phosphor copper is a valuable but too little understood tool for foundries which pour copper-base alloys. This article describes what it is and where and how to use it

ONE OF THE least understood materials used in the average foundry pouring copper-base alloys is phosphor copper. As a consequence, it is often used incorrectly, and what should be a useful tool of the foundryman frequently ends up of negligible value. A few words about phosphor copper are in order—what it is, why it should be used, how to use it to get greatest benefit.

Phosphorus is a nonmetallic material with high affinity for oxygen. It is this property which makes it a valuable aid in the foundry. Theoretically, it would be possible to add phosphorus directly to bronzes; practically, this is not feasible because of the danger of handling raw phosphorus. Hence, an alloy of phosphorus with copper is used since, in this form, it is easily handled, offers no hazard to personnel, and still retains its effectiveness. The most common type of phosphor copper contains approximately 15 per cent phosphorus, 85 per cent copper. It is possible to make alloys with less phosphorus (10 per cent and 7½ per cent are occasionally used) but it is not possible to add *more* than 15 per cent phosphorus to copper.

Promotes Good Melting Practice—Its affinity for oxygen makes phosphorus useful in developing a consistent and efficient melting practice, especially with copper alloys containing tin. Much has been written about the merits of the so-called "oxidizing melting technique." Briefly, the technique depends on the following:

1. Copper and copper alloys will absorb gases when molten and do not give up all of these dissolved gases when the metal freezes, leaving holes, porosity, spongy metal, etc.

2. The two principal gases involved are hydrogen and oxygen which are the components of water. Moisture (as steam or water vapor) is present in the environment around the molten metal so that theoretically *both* gases can be dis-

To obtain full benefit of the oxidizing action of phosphor copper, it is important to add the correct amount to the melt, as with the special 2-oz spoon shown here

COPPER

By ROBERT A. COLTON
Federated Metals Division
American Smelting & Refining Co.
Newark, N. J.

Phosphor copper shot is shipped in 500-lb cans

solved by the metal while it is molten.

3. Following the laws of chemistry, if there is an excess of oxygen available, there will be a lower hydrogen content. Hence the hydrogen content can be controlled by "oxidizing" the metal, or having an excess of air (which contains 21 per cent oxygen) available when melting.

4. This results in a higher oxygen content of the molten metal—usually as oxides of tin, copper, lead, etc., most of which are on the top of the molten metal and make up the slag or dross. Only a part of this can be skimmed.

5. To reduce the remaining oxygen content of the metal, which causes sluggishness, inclusions and metal brittleness, a deoxidizer is needed. Also, something is necessary to prevent additional oxidation (or slag formation) during pouring of the castings.

How to Use It—Many things can be and have been used for deoxidizers with copper-base alloys. To obtain maximum benefit from phosphorus, as 15 per cent phosphor copper, it should be used properly in the correct amounts at the right time.

The general rules for its use are:

1. To have maximum value as a deoxidizer (primary purpose for adding to bronze) "phos-copper" should be added to molten bronze just before the metal is poured into the molds. If added to the charge, or during melting, the phosphorus picks up the oxygen that should be controlling the hydrogen; the result may be gas porosity in the casting.

When the phosphor copper is added to the metal just before pouring, the hydrogen is supposed to be under control and the deoxidizer goes after the oxygen (the oxides or slag) only. Result—low oxide content and cleaner metal and usually *no* gas porosity.

2. With tin bronzes (G, SAE 62, SAE 65) and leaded tin bronze (85, M, 80-10-10, etc.) phosphorus greatly improves castability or fluidity and makes it possible to pour more castings per pot, or to pour thinner sections with lower pouring temperatures because it reacts with the tin and lead oxides (which are thick and crusty), reducing them back to tin and lead. Furthermore, the resulting compound formed with phosphorus and oxygen apparently remains over the surface of the metal, protecting the molten bronze against further oxidation.

There has been no agreement among investigators as to the exact nature of the compound formed by phosphorus and oxygen, but it has been suggested that it is either a gas that stays close to the metal surface or a very thin liquid. Regardless of its exact state, this form of phosphorus is a tremendous aid in pouring bronze castings. By practically eliminating slag the metal pours more cleanly and is more "lively." An additional benefit is control of the tin content which would otherwise be reduced by the amount of tin oxide formed and skimmed off with the slag. Obviously, if phosphor copper is added too early it will not be available as an aid in pouring which is another reason for adding it *just prior to pouring*.

3. Good practice is to remove the bronze (melted presumably under oxidizing conditions) with only enough superheat to allow for handling, skim clean, add the correct amount of 15 per cent phosphor copper. Allow 15 seconds for this to react and

Phosphor copper is added to ladleful of molten bronze after skimming and just before pouring

then pour the castings. When the metal is poured directly from the crucible *all* the phos-copper should be added as just described. When a separate ladle is used, as with a tilting furnace, divide the necessary phosphor copper addition in two equal parts. Place half in the bottom of the ladle and pour the metal over it. This provides for deoxidation of the metal and insures good mixing. Add the remaining half to the top of the ladle, after skimming, as described above in crucible practice. This portion not only deoxidizes, but protects the molten metal against further oxidation and increases ease of pouring.

The amount of phosphor copper to be added to most tin and tin-lead bronze is fairly well established. Each ounce of 15 per cent phosphor copper per 100 pounds of bronze adds 0.01 per cent P to the alloy. The average addition desired is 0.02 per cent P or 2 ounces per 100 pounds. This usually can be doubled without adverse effect, and may be helpful with higher tin content alloys. Experience has indicated that if 0.04 per cent P (4 ounces per 100 pounds of metal) is added it will not seriously affect the hydrogen control in remelting scrap since with oxidizing the phosphorus apparently burns out readily and will not build up.

With high-lead alloys, such as the bearing alloys, up to 0.08 per cent P can be added with beneficial results. Cleaner metal, better physical properties and better fluidity frequently occur with higher phosphorus additions.

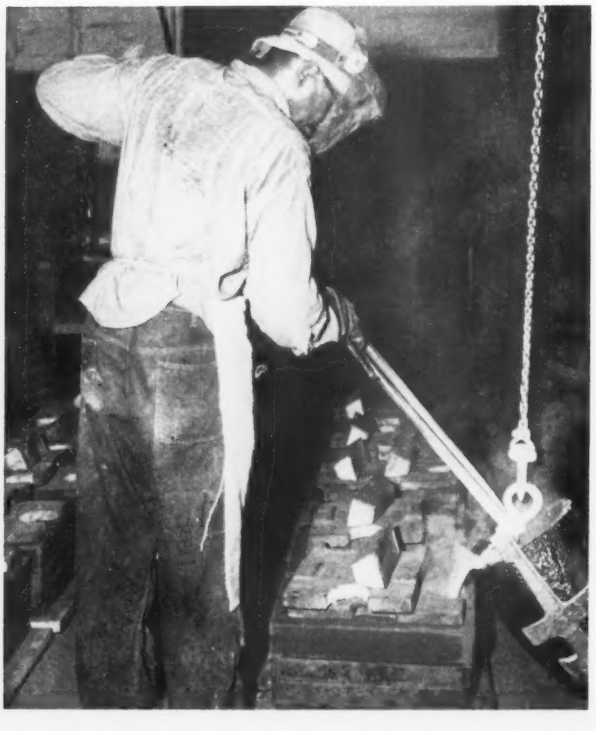
Surface May Be Affected—A word of caution in regard to adding larger amounts of phosphorus to bronze. The tremendous increase in fluidity or castability may cause burn-in or extremely rough casting surfaces. Usually it is necessary to experiment to determine the optimum amount to use in each specific case.

Phosphor copper is relatively inexpensive and as such is often mistreated in the foundry. Being active chemically, it is susceptible to attack by moisture. Store it in a dry, warm place to avoid formation of corrosion products which could contain water. Only dry, clean phos-copper should be added to molten bronze.

Measure Carefully—Measure the amounts used in the foundry carefully. "A handful" is never the same twice. Using too little phosphor copper is highly inefficient and of little value. Adding too much is wasteful and may be harmful. One method for controlling additions is to weigh out the additions on a scale and put them into coin envelopes. Another method of handling shot (in addition to weighing and using coin envelopes) is to measure by volume. Have the correct size of container with the shot so the melter adds the same *volume* each time. A small ladle of the proper size often serves admirably.

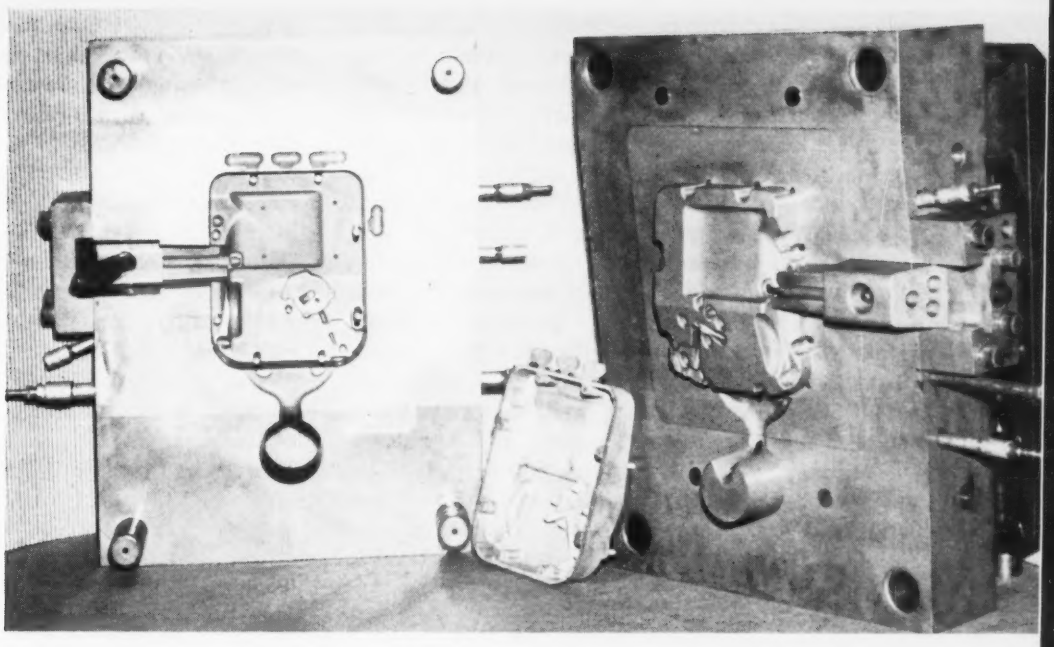
Whatever method of controlling the amount of addition is used, be certain to add phosphor copper with discrimination and it will be a valuable aid in pouring most copper alloy castings. Phosphor copper is not considered necessary in the melting and pouring of silicon bronze, aluminum bronze and manganese bronze. Best results are obtained with copper alloys containing tin and lead. With high tin and lead contents, phosphor copper is a necessity if sound, gas-free sand castings are to be poured.

In the manufacture of high-conductivity copper castings, phosphor copper can be used advantageously to reduce gas content without seriously impairing electrical conductivity. Newest developments indicate that 15 per cent phosphor copper used in conjunction with lithium or calcium boride will do an effective job of deoxidizing and degassing copper more economically than using lithium or calcium boride alone.



Left—Bronze is poured into mold a minute or two after the phosphor copper has been added

Below—When large amounts are needed, 12-lb waffles of phosphor copper are convenient form



Die for casting a chain saw fuel tank, with finished magnesium casting in foreground. Magnesium and aluminum are similar in die casting design

Die Casting Magnesium

Use of magnesium die castings has enabled McCulloch Motors Corp., Los Angeles, to design better products. This report is condensed from a paper presented at a recent Magnesium Association meeting

By SHERWOOD H. EGBERT
Vice President, Manufacturing
McCulloch Motors Corp.
Los Angeles

IN JANUARY, 1946, McCulloch Aviation Corp., moved from Milwaukee to Los Angeles. A nucleus of 33 Milwaukee employees made the transfer, and in two and a half years the number of employees increased to 400. Its name changed to McCulloch Motors Corp., the company at that time was producing a compactly designed 2 to 3-hp, two-cycle gasoline engine which made extensive use of aluminum die castings. The engines were sold to lawnmower and chain saw manufacturers.

Late in 1947, the company decided to enter the chain saw manufacturing field with a new type of portable chain saw engineered to meet a market apparently not touched by others. To obtain a high ratio of horsepower to weight, a saw was developed which made maximum use of aluminum die castings. The finished 5-hp saw, complete with engine, blade and chain, weighed in excess of 54 lb. It was still too heavy. For maximum versatility and reduced operator fatigue, a lighter saw was needed.

Magnesium die castings appeared to be the answer. To keep within company policy, these castings would have to be processed from ingot to finished piece in the home plant. In 1948 a gasoline-engine-driven chain saw featuring magnesium die castings was available. It weighed 49 lb and had a 5-hp drive. But a still lighter saw was required. In 1949 a 3-hp saw weighing 25 lb was being made, and the horsepower-weight ratio of today's saw averages 1 hp to 6 lb.

Today a growing line of chain saw models, lawnmowers, superchargers, post hole diggers, military drone aircraft engines and compressors moves steadily off assembly lines. For the past few years, about 1¼ million lb of magnesium castings have been produced each year, in about 2½ million

cast parts ranging from a 36-oz crankshaft to a control knob weighing a fraction of an ounce.

During these years of growth and development in the magnesium die casting field, the McCulloch plant has learned much by trial and error about processing magnesium die castings. Ideas, techniques and processes that follow are indicators of some of the knowledge gained.

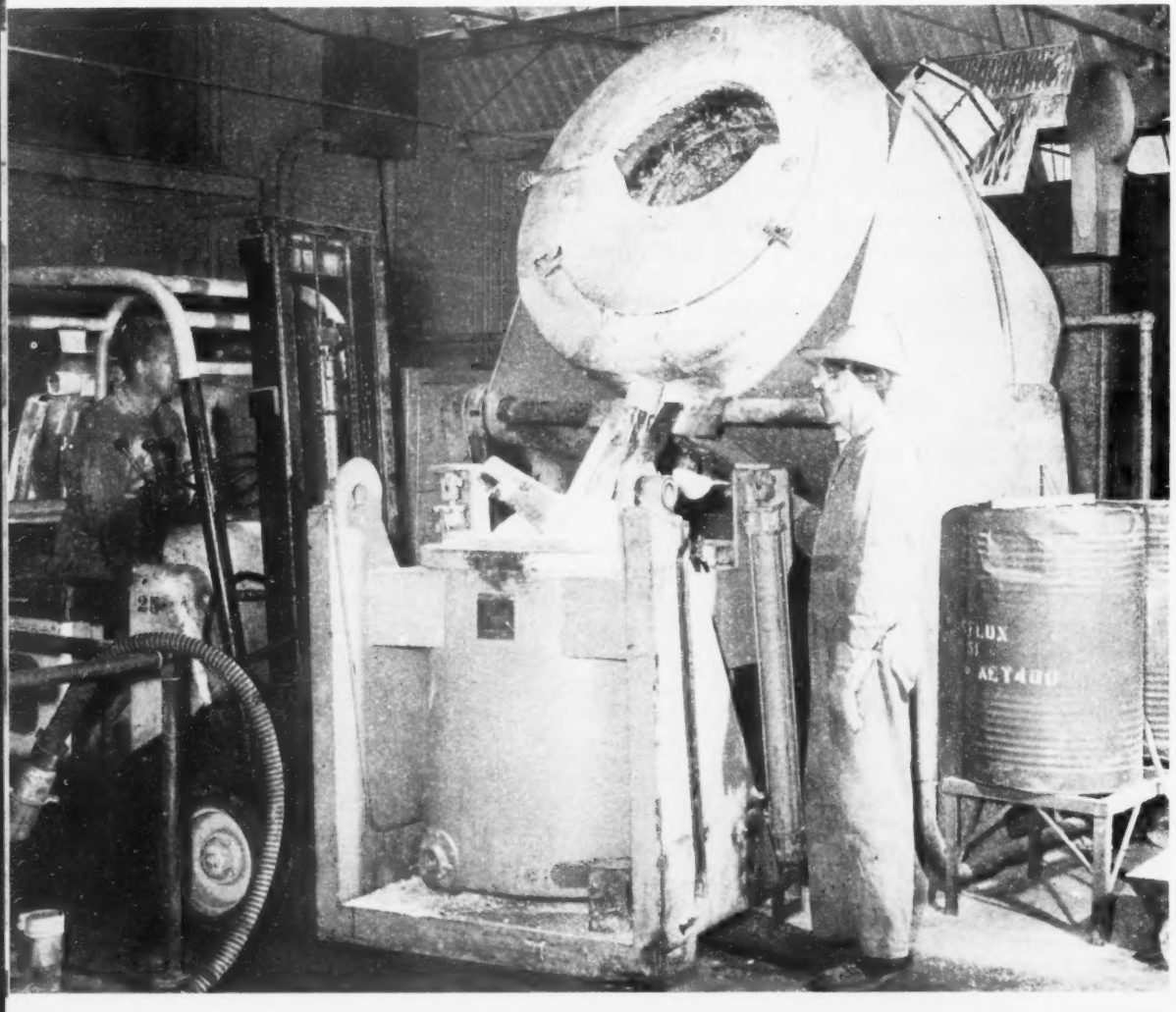
Comparable to Aluminum—Basic design of a magnesium die casting does not differ widely from that of an aluminum casting. In early chain saw models (designed for aluminum), magnesium was substituted with minimum design change. Magnesium has less tendency to "weld" to the die, and a smaller draft angle than is used with aluminum can be employed. Maximum permissible draft angles should be used in design to facilitate the casting process. In general, McCulloch engineers employ a 2-degree draft angle in all cases except special instances where the function of the casting requires less. Heavy sections, abrupt changes in wall thickness and sharp fillets are avoided.

The function of the engineering department is to design the most efficient part from the most suitable material at a practical production cost. For this reason, although there has been a move toward magnesium, it has not been complete. The company's production chain saw model contains 33 magnesium, 8 aluminum and 3 zinc die castings.

Die costs vary from a few dollars to several thousand dollars, and costlier dies are constructed to last almost indefinitely by making individual die sections replaceable without the need for complete die replacement. In die core and cavity construction, the company uses a "hot works" die steel of 5 per cent Cr, 1 per cent Mo and 1 per cent V type, heat treated to Rockwell C 44-46. Heat treated alloy steel is used for the holding blocks. About 90 per cent of all engineering changes are made with the die in the hardened stage.

Electric Furnaces Used—Specially designed, resistance-type electric breakdown, transfer and holding furnaces are used. Magnesium is broken down into molten form in an 800-lb capacity breakdown furnace and transported in a 300-lb capacity transfer furnace by lift truck to a holding furnace located beside the die casting machines. Advantages of this system are 1) centralizing of ingot storage, ingot preheat oven and breakdown furnace, 2) delivery of hot molten metal to casting machine eliminates fluctuations in metal tempera-

Hydraulic cylinder tilts 800-lb capacity breakdown furnace to pour molten magnesium into a 300-lb capacity transfer furnace mounted on a truck



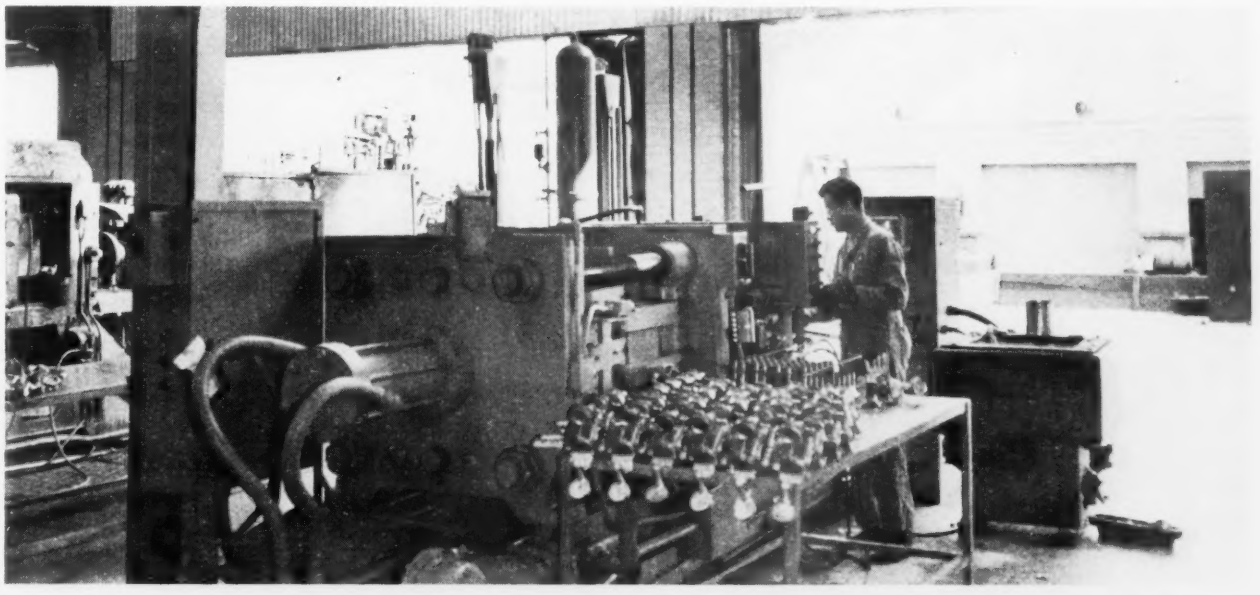
ture each time an ingot is loaded into a furnace, 3) closer control of metal is possible should metal require refinement, and 4) a cleaner supply of metal is available continually.

There are some drawbacks to this system, and consideration has been given to installation of a simpler and more efficient method of metal transfer.

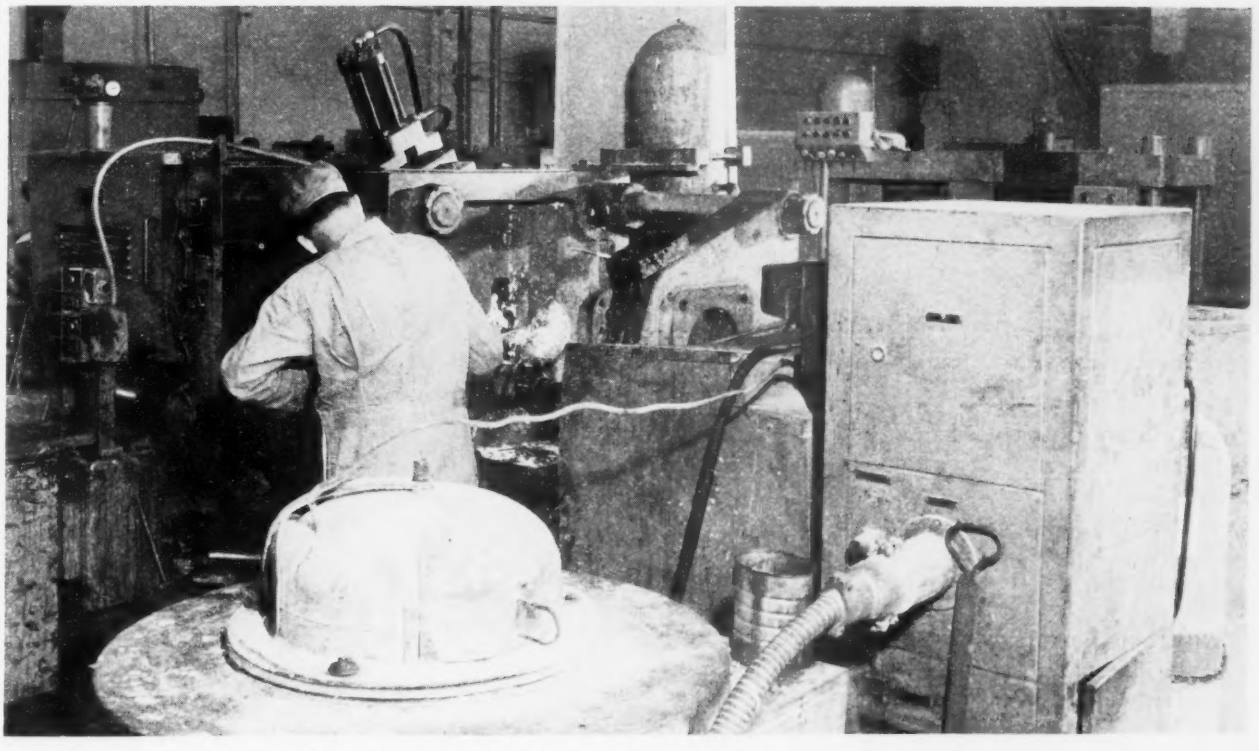
The 300-lb capacity holding furnace has a sulphur dome. Bottled sulphur dioxide is piped into the dome at a predetermined rate to protect the surface of the melt. The sulphur dioxide atmosphere prevents oxygen from coming in contact with the molten magnesium, although occasionally some surface burning occurs. This is controlled with a minimum sprinkling of flux.

Whenever a holding furnace is left unattended, the flow of sulphur dioxide is shut off, a layer of flux sprinkled on the melt and the access cover in the dome left opened. With this procedure, if the magnesium begins to burn, it will be noticed. If a closed access cover were to be opened suddenly, the inrush of air would create an explosion possibility.

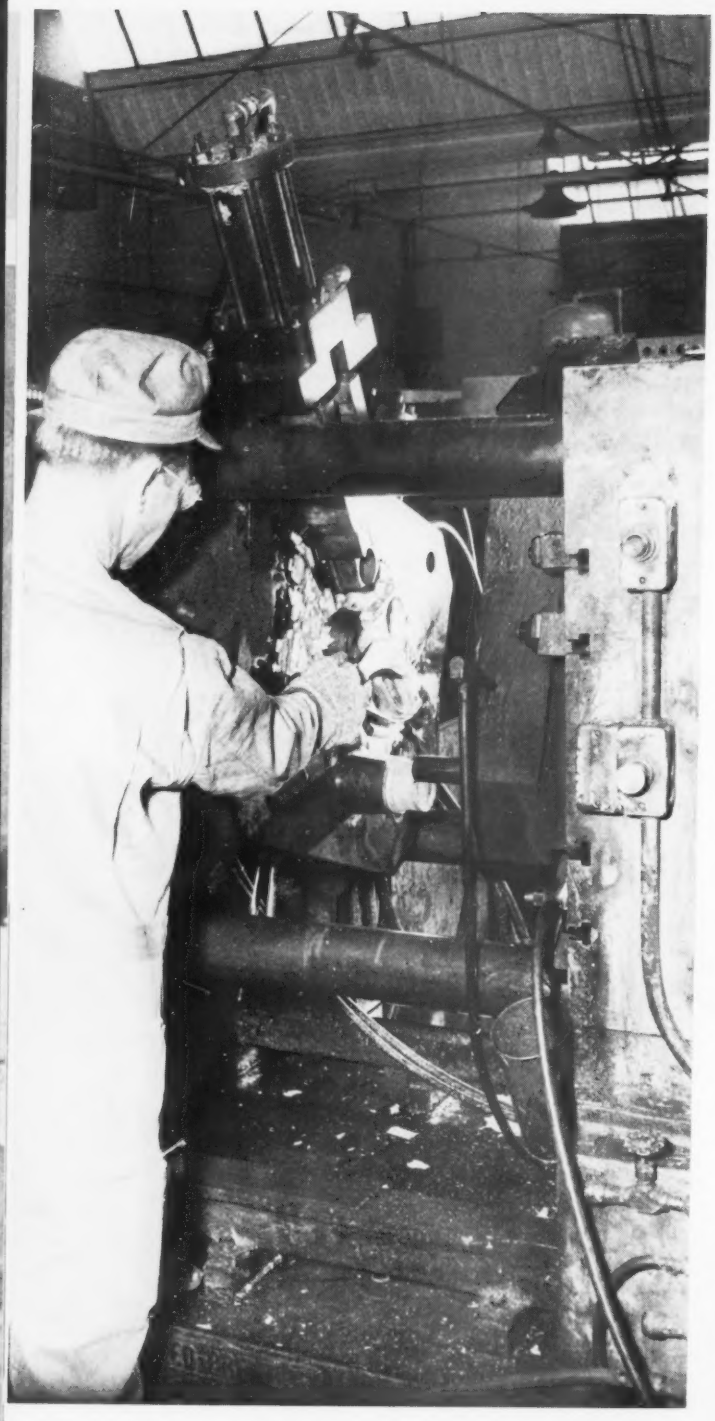
Furnace crucibles, or pots, are made of a high-strength, low-alloy manganese steel. The break-



Southern California weather permits open ventilation, and the entire east wall of the plant is open. Additional ventilation is provided through the skylights



Holding furnace with sulphur dome stands forward of a die casting machine. The pneumatic line to the dome is for sulphur dioxide gas under controlled pressure



With the slide retracted, the machine operator removes a magnesium crankcase casting from die

down furnace pot is fabricated of 1-in. steel side walls and a 1¼-in. steel bottom. The smaller pots have ¾-in. side walls and bottoms. Breakdown and holding furnace pots are metallized on the outside surface with nickel-chromium and with a coating of aluminum to protect the surface from oxidation.

Although metallizing doubles the initial cost of a pot, its life span also is doubled, thereby effecting considerable saving in downtime and maintenance costs on the furnaces. Unmetallized pots scale excessively; this scale can damage the furnace heating elements.

Hazards Not Unusual—When properly handled, magnesium can be melted without unusual hazards. All safety precautions observed for handling any molten metal should be enforced and serious attention also given to the following: All ingots, ladles, thermocouples, sludge pans and other material coming in contact with molten magnesium must be fully preheated before use; rust and other foreign matter should never be permitted to accumulate in a furnace. Should a pot break and molten metal come into contact with oxides, an explosion could occur.

All scrap castings, butts and runners are accumulated and sent out for commercial refinement and realloying. A chemical analysis is submitted for each lot. The reclamation service is performed at a cost of 2½ cents per pound of refined metal with an 11 per cent metal loss. Manufacturing space limitations, industrial zoning and smog control factors preclude plant reclamation of scrap.

A standard commercial magnesium is used for all castings. Methods of handling vary with the type of casting. In general, large, thin-walled castings require a high-speed, medium-pressure metal injection. Heavy-walled castings, or castings with thick bosses, require slow-speed, high-pressure metal injections. Small castings pose no particular casting problems.

Die Casting Department—This department contains 15 machines, of 150, 250, 400 and 600-ton locking pressures. The four types have been standardized with identical electrical connections. With injection speeds not a critical factor for smaller magnesium castings, standard machines of 150 and 250-ton sizes are satisfactory as delivered. Some modifications to increase injection speeds to handle large, thin-walled castings are made on the 400-ton machines. The 600-ton units are used as delivered.

Dust collector on belt sander efficiently contains fines and prevents clothing contamination

Experiments are continuing to settle on a non-inflammable hydraulic fluid satisfactory for use in die casting of magnesium. Several types of fluid have been used with varying success.

Magnesium fines and dust generated from grinding create a potential hazard if allowed to accumulate. If sufficient moisture is present, the fines will liberate hydrogen and become explosive. An oil-immersion collecting system has been developed for use with belt sanding equipment. It immerses fines in a bath of oil and holds them until they have been removed. Two surface grinders, which also use the oil immersion system, are located in a separate room devoted exclusively to grinding. State safety code regulations require this arrangement. A stock-type filter removes a sufficient percentage of the fines and dust to make the self-contained filtering method practical.

Rules for Machining—Magnesium is an easily machined metal if properly handled. The company's early experiences indicated that small fires during machining operations were caused by any of three factors—too fine a cut, a dull tool and allowing chips to accumulate around the machine. Three rules for magnesium machining have developed over the years. When followed, they eliminate all troubles: 1. A trained operator. 2. A sharp tool. 3. Cleanliness. Of the three, cleanliness is perhaps the most important.

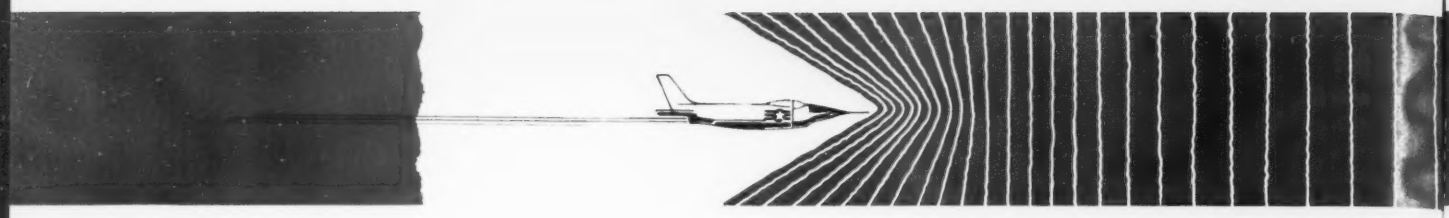
In the McCulloch plant, facing and turning operations and some boring operations on large castings are done dry. Such other operations as spindle drilling, tapping, and reaming are done using oil. Milling operations are done dry. Experience has proved that where a cutting oil is not needed, it is safer to run the machine dry. Fire hazards do become present if chips and turnings become so fine as to be airborne. Where this is a problem, the operations are placed under oil, which serves both as a cutting lubricant and as a reducer of the fire potential.

When the company first started magnesium die casting work, the Los Angeles Fire Prevention Bureau and fire inspectors believed that all magnesium operations should be done in buildings or rooms separate from the main plant. Six years of experience have proved to company management and to the Fire Prevention Bureau that magnesium products can be manufactured safely if proper precautions are taken and personnel are trained.

Cleanliness and good housekeeping are so important a safety factor in the use of magnesium that the McCulloch plant executes and rigidly enforces a program that covers these points: Grinding rooms and burring areas must be cleaned continually. Floors and machines must be swept and wiped clean at least once every four hours—and more often if production of chips and shavings is unusually heavy. All pipes, fixtures and flat surfaces must be cleaned every two or three weeks, depending upon the efficiency of the collection equipment. Clothing of personnel must be watched since any accumulation of dust or oily powder is hazardous. Fines must be removed from oil before they clog pumps and lines. Filters must be serviced several times each week.

After final machining, and prior to assembly, magnesium die castings are chemically treated to protect the surface from corrosion and to provide a bond for subsequent painting. A treatment was developed at McCulloch to provide a method of pickling which was fast, simple to maintain and economical, but it is not recommended as a general pickling process. Surface treatment is to dip castings in a hot caustic tank for 60 seconds, rinse in clear water, dip in chromate tank 20 to 30 seconds, rinse in clear water, rinse in hot water, heat and air blow dry.

In a specially designed grinding machine, individual doors in hood open at each operator's station. Note the essential warning on the rear wall



Steel Castings for Aircraft

Challenge the Foundry Industry

Steel castings have a potentially vast and lucrative market in the aircraft field, but acceptance standards will be much higher than those commonly used now

By HAROLD E. SIMMONS
Metallurgist and Steel Foundry Foreman
AiResearch Mfg. Co., Garrett Corp., Los Angeles

FOR THE LAST three decades our economy has been geared to the automotive and railroad industries. Ferrous foundries have naturally developed quality standards based on demands of these two groups; meeting these standards usually satisfied the requirements of customers in other fields.

New eras—specifically electronics and the jet air age—are approaching. Many feel they are already here. To the economy this means a changed outlook in which these new industries stand ready to vie with the ruling giants for economic leadership. To steel foundrymen the meaning is significant and pointed: If you want your share of this potentially vast and lucrative business, forget your present acceptance standards. Begin thinking in terms of standards based on the current inspection techniques such as x-ray, fluorescent penetrant, magnetic particle, ultrasonics, and an influx of other methods which sometimes seem designed to reject rather than inspect castings.

Likely You Are Normal—If the challenge of producing castings to these more exacting standards proves disconcerting to you as a steel foundryman, consider yourself normal. Perhaps you have sufficient commercial business on the books to keep your facilities operating at a high rate well into the foreseeable future. Or maybe you simply have no inclination to even attempt castings of this nature, regardless of general business conditions. In either case you would be among the 80-90 per cent of steel foundrymen who will not be faced with the problem of meeting the challenge, at least in the near future. I do feel that eventually most castings will be made to a new series of standards based on the requirements of these young but rapidly developing industries. Those founders entering the picture early will have a decided advantage in that experience is essential to success in producing aircraft quality castings.

Here Are the Answers—There are many questions in the minds of potential vendor foundries. Let's attempt to clarify some of the basic considerations by a simple series of questions and answers.

Q. Should I consider making aircraft castings?

A. Absolutely.

Q. Why? A. The opportunities in the field today are substantial, and they are increasing at a tremendous rate. As stated earlier, I believe that sometime, and perhaps sooner than we realize, most castings will be produced to aircraft standards. With the profound technological advances taking place, how could it be otherwise? The introduction of the gas turbine engine could result in an upward revision of standards in the automotive field soon.

Q. Is there much financial risk in producing aircraft castings? A. Yes, and this does eliminate many possible vendor foundries.

Q. What type of foundry should undertake aircraft work? A. In the first place, the foundry must be a "good" one. That is, it should show a proven record of successful operation. Manage-

Molds are inspected by the author, Harold Simmons, metallurgist and steel foundry foreman, AiResearch Mfg. Co., a division of the Garrett Corp., Los Angeles, as plant assistant watches

ment and supervision must be in competent hands. While financial stability is mandatory, I definitely would rate experience and *proven* ability as most important. Many of the leading foundries are setting up aircraft divisions. This is a sound idea since the subsidiary would have experienced personnel available for assistance coupled with sound financial backing by the parent company.

A personal thought is that many of the foundries entering this field will be new foundries owned and operated by those who have had considerable experience, particularly in the production of aircraft castings. They may be treading on risky ground financially, but if they have or can obtain sufficient capital to nurse them through the inevitable early bumps and bruises, they should soon find themselves in an excellent competitive position.

Q. Having decided to enter the field, how do I obtain orders? A. The standard sales approaches apply to aircraft castings. Actually, a serious scarcity of vendors exists, and once a foundry has acknowledged an interest in producing aircraft parts, trial orders generally will be placed.

Q. Are there any precautions to consider in obtaining orders? A. Emphatically yes. In fact, your success depends in large measure on what transpires before a job ever enters your foundry. Let me emphasize a point: Do not quote on a casting until you have done everything possible to insure an understanding of inspection requirements. Often, blueprints do not clearly define engineering thought. Clarify all doubts, and be certain that purchase orders spell out what is expected.

Now, problems frequently do arise. In most aircraft plants one generally contacts purchasing representatives. Between the design engineer and the purchasing department exist a multitude of functions and a maze of people. The request for castings eventually placed for order may lack information essential to a sound quotation.

In this situation which, unfortunately, is common, you have but one recourse. To back track through the jungle of people and functions is a formidable job. The recommended solution is to quote a price, at least for the initial order, to cover added foundry control and inspection costs. Then, submit samples for both layout and foundry control approval. A layout or dimensional check is mandatory in any case and approval is usually obtained in writing. Foundry control is commonly left to the discretion of the vendor. To protect yourself on an uncertain job, I would strongly recommend that, at your own expense if necessary, samples be submitted and agreement reached with authorized engineering or inspection personnel as to what shall constitute acceptable foundry control. Your samples can serve as a guide for future reference.

A seemingly insignificant but important point to remember is: As a rule it is the function of the purchasing department to co-ordinate between plant and vendors. To maintain friendly relations,

arrangements for meetings with any company people should be made through purchasing rather than by direct contact.

To reiterate: Accurate job casting and eventual job profit are determined by a complete understanding of what you are expected to produce. Beware rather than be sorry.

Q. Aircraft companies have a faculty for ordering castings—and other parts for that matter—on a rush basis. This does not allow foundries sufficient lead time to insure aircraft quality castings. How do we best approach this problem?

A. I'd like a practical answer to this question. Aircraft people insist that the nature of the business creates the problem. Delivery time is often the determining factor in potential business for them, and naturally the red flag is flown right down the line to vendors. Personally, and probably speaking for the minority, I do not feel that foundries should accept an order without benefit of layout approval and foundry control. The procedure just discussed of submitting samples should be followed. The buyer can expedite inspection of these samples, and an answer usually can be given as to acceptability in a matter of hours. No one has as yet convinced me that it is cheaper to gamble on 100 castings and scrap them for a dimensional deviation or shrinkage exposed by x-ray than it is to submit 5 samples for an examination that can be completed in a few hours. Nor is it faster when the parts have to be made a second or third time.

My answer is that samples should still be submitted for inspection prior to production. The responsibility for castings produced without benefit of sample approval should be placed on the buyer, and the purchase order should so state.

Q. Turning to the subject of production, must the foundrymen turn to the newer processes to successfully meet these higher quality standards? A. To produce, definitely "No." A well managed and organized green sand foundry that is progressive and quality minded in its thinking can meet most of the standards.

Q. Will these new processes find a place in aircraft casting production? A. Absolutely. In fact, they will be boosted into prominence much sooner by the aircraft industry. The widely discussed shell and ceramic molding processes should see widespread application. Investment casting is undergoing a boom. For aircraft castings I feel that these processes will eventually replace the historical sand practices. There are two reasons for this belief.

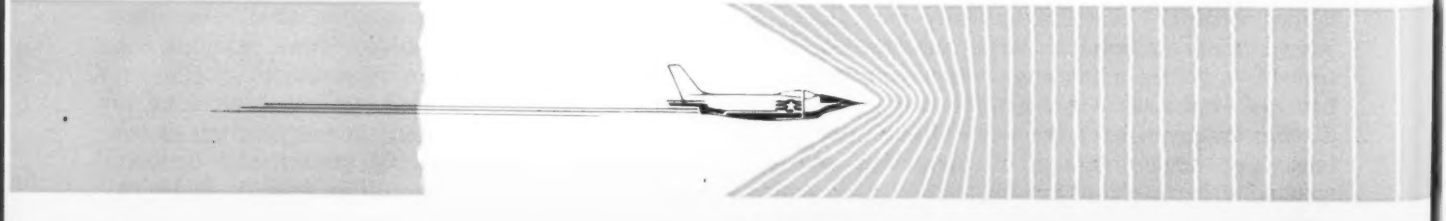
1. *Consistency of product.* This results not only because the process itself may be superior, but mainly because foundries who adopt these new ideas invariably tighten up and control their overall procedure, from patternmaking to molding through molding and cleaning. This is basic to success in producing aircraft castings. Frankly, it is the difference between making aircraft and so called commercial castings.

2. *Cost.* The castings are cheaper. This may come as a surprise to the average foundryman who has long since decided that no method can cost less than green sand. Remember that our discussion is of aircraft castings, and the cost with which we are dealing is the cost of castings actually purchased by your customer. Aircraft inspectors possess the eyes of an eagle and the persistency of a tortoise as they practically bare your castings naked. Consistency plays a dominant role. Get them in the habit of expecting a quality product from you. This will prove far more effective in cementing good will and increasing profits than will a high production rate in your foundry.

Q. In other words, current foundry practices are suitable, but the newer processes seem preferable? A. Exactly. The only point to be brought out is that you must not throw away your years of experience. Use techniques with which you are familiar. Merely change your views on acceptance standards. Get your feet wet. Try the pulse of the aircraft industry by bidding on a few jobs. Then, as progress is noted, experiment with the new fads and evaluate them in your operation. Believe me, if nothing else is realized, you will at least develop a much more efficient and profitable operation for your standard items than the one to which you had previously been accustomed.

This is enough of an introduction to the aircraft industry. Accept this paper for its sole purpose—to break the ice for foundrymen who are considering the industry as a source of business, and to stir the interest of those who until now either had no yen for such business, or perhaps were not even aware that steel castings had a place on an airplane.

In closing, one further comment. Foundrymen are an independent group of individuals. In many ways this is praiseworthy. But our "rugged individualism" has forestalled technical progress while competitive methods of fabrication have advanced. This is not good business. The aircraft industry is laying it on the line for the foundry. They're saying, "We've got the business for you. Just produce it to our standards." And they will not back down in their demand for high-quality castings. The end result is obvious. Foundries will become more capable than they ever thought possible. Then the steel foundryman can thank the aircraft industry for issuing the challenge.



Keeping equipment in good condition, plus care in molding and in mold handling, can prevent occurrences of several common casting defects

Brass Casting Defects

—Their Causes and Cures

This article, No. 12 in Mr. St. John's series on The Brass Foundry, is the first of two on casting defects

By HARRY ST. JOHN
Foundry Consultant

EVERY gathering of foundrymen, formal or informal, gets around sooner or later to a discussion of casting defects, what causes them, how they may be prevented. In some instances the causes are evident, the cure a matter for clearly defined action, not debate. In others the source of trouble is obscure, often complicated by several contributing factors.

It is seldom possible, merely by looking at a defective casting, to say with confidence just what has been the cause of trouble. One needs to know what the metal was like to begin with and how it has been handled during its progress from raw material to finished casting. At times there can be an honest difference of opinion as to whether the defect is due to a foundry fault or to an error in the machine shop.

The foundryman has one situation to deal with which was unthought of a few years ago. A casting which is sound but slightly imperfect in shape, or perhaps with a small lump on its surface, can often be machined on a monitor to yield an acceptable product. Modern automatic machines, in which a series of operations is performed without the guidance of a human hand, do not tolerate such imperfections. As a result, castings which would formerly have been passed without question must now be scrapped. Improved machine-shop methods and equipment, calculated to result in savings, require the foundryman to do a better job than before if the expected savings in the shop are not to be lost in the foundry.

Hidden Defects Expensive—When castings are inspected before delivery to the machine shop, those having visible defects can be scrapped at that point. Defects which become apparent only after machining naturally result in a greater loss because of the added work which has been expended on them. The foundryman needs to concentrate on defects of this kind and, when there is a choice, prefers to take chances which may result in visible rather than in hidden flaws.

Imperfections visible at the rough-casting stage are often due to careless or unskillful molding or to the handling of the molds. The condition of equipment is also a factor. Suppose we consider the more obvious ones first.

1. Shift—Castings in which the cope and drag portions do not match exactly at the parting line are a common foundry trouble. Except for use in automatic machines, a slight shift can be made presentable in the grinding room and tolerated in the machine shop. The defect may be due to a number of possible causes:

a. If every gate of castings shows the same shift in the same place, the pattern needs correction.

b. If solid flasks are in use, the pins and bushings may be worn to a sloppy fit.

c. In the case of snap flasks, the pins and bushings may also be at fault but there are other possibilities. There may be careless handling of the mold before the jacket is put in place. Roughness in placing the jacket may move the cope. If the molds are moved on a roller conveyor before the jackets are placed there may be bumping, particularly if some of the rollers are stuck so that they will not turn. If roller conveyors are to be used with snap-flask molds, great care must be taken to insure that the rollers turn freely at all times and that they are not too widely spaced.

2. Crush—If there is a displacement of sand into a mold cavity at any time before the casting is poured, the casting will exhibit what is called a

crush. This can be caused by any of the following conditions:

a. The flask may not rest perfectly flat on the pattern plate, leaving an excess of sand at some point; or the two halves of the flask may not fit each other perfectly. In the case of solid flasks exposed to heat during pouring, the trouble may be due to warping.

b. The molder may be careless in closing his mold.

c. The weight may be placed on the mold too heavily.

d. There may be a crush at the core if this is too large to fit into its print. This trouble may be due to the pattern or to the corebox. Both should be checked.

3. Swell—The cope portion of the casting is larger than the drag, more or less all around the parting line, due to weakness of the cope in resisting the pressure of the metal. Two possible remedies are available:

a. The cope may need to be rammed harder.

b. A heavier weight may be needed.

4. Variation in Wall Thickness—Assuming that neither pattern nor corebox is generally worn, we are concerned here with cored castings which are too thick at one point and too thin at another. If this variation is visible at a cored opening, it is easily detected. Elsewhere in the casting it may be almost impossible to discover by any simple, nondestructive method. In a pressure casting a thin wall is likely to be of vital consequence. In automatic machines a casting with a slightly off-center cored opening may be unusable.

Castings in which hidden wall thickness may be critical can be checked by cutting open castings which have been rejected for other causes. If these scrap castings are found to have a uniform wall thickness, it is fairly safe to conclude that all castings are satisfactory in this respect; but if a serious variation is found in the scrap castings, all must be under suspicion and a 100 per cent check is in order. Causes and remedies include the following:

a. Although the over-all dimensions of the core may be correct, the corebox may still be at fault. This is particularly true of cores made in a core-blower where the flow of sand may have resulted in excessive wear at one or more points. This can most easily be detected by making and checking plaster cores.

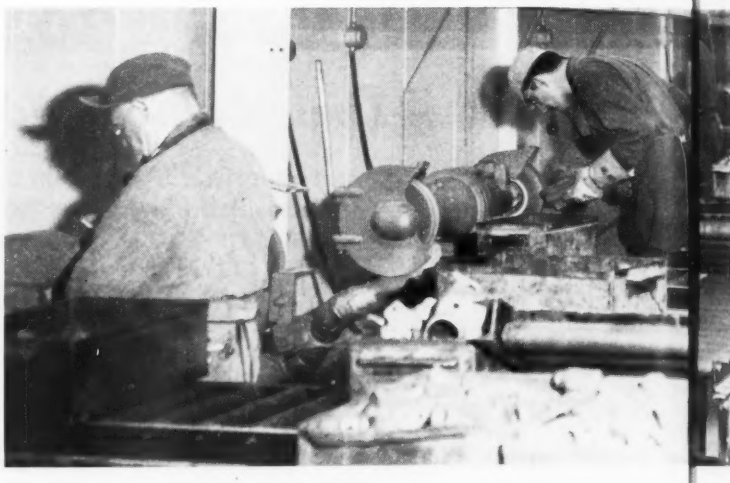
b. A core may be slightly out of shape because of sagging while it is still green. A plaster core check will reveal this condition, which must be corrected by providing proper support for the green core during handling and baking.

c. If the pattern core prints are oversize, the core will shift out of position when metal enters the mold. Check by trying plaster cores in a plaster mold.

d. The design of the casting may be such that the core can be supported at only one point. In this case it is necessary to use a longer and heavier print than usual to prevent floating of the unsupported portion of the core.

5. Misrun—This condition is a failure of the metal to fill all parts of the mold cavity. Unless it occurs in a cored section of the casting, which is unusual, it easily detected. Causes of this defect are numerous:

a. A misrun may result from pouring metal too cold. To this condition there may be several contributing factors. If the trouble cannot be corrected by raising the temperature at which pouring starts, it may be necessary to decrease the number of molds poured from one pot of metal. If the misruns invariably occur in the castings at the far end of the mold, away from the sprue, a cold-metal trap may help. This is a sort of dead-end street at the end of the runner, designed to catch the first metal to enter the mold, metal which has served to heat up the sand lining the sprue and runner and has thus become chilled as it gave up part of its heat.



b. The design of the casting may be at fault, if the metal is required to flow too far through a very thin section. It is sometimes cheaper to give away a little metal and thereby reduce the number of rejects.

c. For most nonferrous alloys, particularly the red metals, the mold should be tilted downward from the sprue, as much as 1 inch to the foot, thereby increasing the hydrostatic head for those castings which receive the first or chilled metal, which has lost heat in the mold.

d. Inadequate gating may be responsible for misruns.

e. Sluggish metal has been discussed in a previous article on impurities. Such metal must be poured hot and the number of molds limited if misruns are to be avoided.

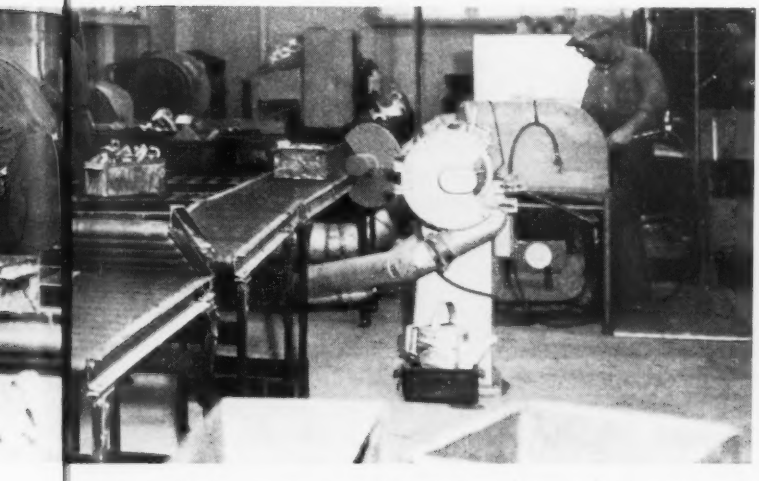
f. If the flow of metal into a mold cavity is interrupted, even momentarily, the surface of the metal in the partially filled cavity will start to freeze and block the flow of additional metal into the unfilled portion. An uninterrupted flow of metal is best assured by the use of strainer cores or other choking devices with a sprue which is kept full throughout the pour.

g. An abnormally thin section caused by a mis-

shapen or floating core is likely to result in a misrun.

h. If the mold is not sufficiently permeable, the air and steam in the mold cavity cannot escape rapidly enough to permit filling of the cavity before freezing. This condition can be aggravated by evolution of gas from the core. A more permeable mold may be the answer or, in extreme cases, it may be necessary to make vent holes from the mold cavity to the atmosphere.

j. If the mold is not completely closed or is insufficiently weighted, there may be a "runout." The entire cope portion of the mold will misrun, molten metal escaping from the mold at the parting line, to the considerable hazard of workmen and bystanders.



Most expensive defects are those which are not discovered until after finishing or machining. The foundry should concentrate on avoiding them

6. Coldshut—This defect looks like a crack in the metal but is really an area where two streams of metal have been pressed into close contact without actually joining. It is distinguished by a smooth surface with iridescent coloring. It is closely related to a misrun and often due to much the same causes. If other conditions are correct, coldshuts usually require a change in gating.

What may be called a false coldshut sometimes occurs when a crush forces a thin web of sand into the mold cavity, tending to block the flow of metal at that point.

7. Hot Cracks—Such cracks somewhat resemble coldshuts but are true cracks. Like coldshuts, they are highly colored but, instead of a smooth surface, they have the ragged contour characteristic of a fracture. It has already been mentioned that many of the nonferrous alloys are hot short. If the castings are roughly handled while still red hot the metal easily cracks along lines of least resistance. Unfortunately, these cracks are often so faint as not to become apparent until the castings are being machined.

To avoid this difficulty, castings should be allowed to cool in the sand to a temperature of 600°F or less. For castings weighing several pounds each this is likely to mean a cooling period of 30 or 40 minutes.

8. Sand Wash—This condition occurs when a portion of the sand mold is washed away by the force of the metal and unwanted metal fills the space thus vacated. Sometimes this metal can be removed by grinding, more often the casting is spoiled.

The difficulty is caused by a weak section of the mold coupled with a gating arrangement which directs a stream of metal against the weak section. The sand itself may be unduly weak or the mold may not be rammed hard enough. Sometimes, under the guise of efficiency, the pattern is so crowded with castings that a sufficiently strong sand structure cannot be attained. Here the remedy is to redesign the pattern layout with fewer castings.

A similar effect is produced when part of the mold sticks to the pattern as the latter is drawn. This, of course, should be seen by the molder and the mold should be scrapped, but it occasionally happens that such a mold gets into the line and is poured. This trouble may be due to weak sand, to lack of parting compound on a wood pattern, or lack of heat in a metal pattern.

9. Scab—Best modern practice calls for hard molds. When hot metal strikes the face of the mold, the sand expands and, if too closely packed, room for expansion is lacking. The sand structure buckles, with the result that the casting shows spots where a mixture of sand and metal forms rough lumps on the surface. To avoid this condition and at the same time have a hard mold, about 1 per cent of flour is intimately mixed with the molding sand. Wheat flour can be used but wood flour works about as well and costs less.

10. Sand Blow—When hot metal comes into contact with the moist surface of the mold, steam is generated. If the amount of steam is excessive or the sand is not sufficiently permeable, the pressure of the steam prevents the metal from forming a smooth surface against the mold wall. The resulting hollows in the outer surface of the casting are known as sand blows. The remedy is a drier and/or more open sand.

Even when the temper and permeability of the sand are within proper limits, blows are often caused by "clay balls." When the hot metal strikes a moist nodule of clay which has not been broken up and thoroughly mixed with the sand, a tiny explosion occurs. This results in a depression in the surface of the casting, with signs of dirt embedded in the metal. The presence of clay balls results from a new, naturally bonded sand which has been added without the thorough mulling needed to insure an intimate mixture of clay and sand. A blended, or so-called synthetic sand, has the advantage over a naturally bonded sand in that it uses one-third less water in the molding sand mix and, if properly prepared, is free from clay balls.

Other common defects, their causes and how to correct them will be discussed next month in the concluding article on defects.

Foundry Training Needs

Results of a study made by Labor Department officials working with representatives of the foundry industry indicate a growing need for service employees like patternmakers and maintenance mechanics and electricians

ON JULY 20, 1955, a group of foundry industry representatives met with Labor Department officials in Washington to discuss foundry manpower requirements and training needs. Industry representatives included Fred G. Sefing, International Nickel Co., New York, chairman; Cal C. Chambers, Texas Foundries Inc., Lufkin, Tex.; W. J. Klayer, Aluminum Industries Inc., Cincinnati; P. E. Rentschler, Hamilton Foundry & Machine Co., Hamilton, O.; Herbert F. Scobie, *Modern Castings*, Des Plaines, Ill.; Frank G. Steinebach, FOUNDRY, Cleveland; and B. C. Yearley, National Malleable & Steel Castings Co., Cleveland.

Labor Department and industry representatives agreed that more information was needed concerning manpower developments in foundries which carry out a large proportion of their operations with mechanical equipment.

A questionnaire requesting the desired information was developed, and the foundry industry representatives suggested a list of 44 establishments to be included in the study. Chairman Sefing sent a letter to a top official of each of these foundries which explained the purpose of the study and requested his co-operation.

In January and February, 1956, field representatives of the Department of Labor visited each of the foundries. Usable returns were received from 43 of the 44. All but two of the 43 were found to be highly mechanized, and the following analysis is based on the data supplied by the 41 mechanized plants. This group included relatively small foundries as well as large ones. Nine employ 1000 or more workers, and two employ fewer than 150, as shown in Table I.

The 41 foundries included in the study are responsible for about 9 per cent of the production and employment in the foundry industry in the USA, as indicated in Fig. 1.

What Are the Jobs?—More than 85 per cent of the employees of mechanized foundries are operating or service workers. About 5 per cent are foremen, slightly more than 1 per cent are engineers and scientists, and about 1 per cent are technicians. The remaining group, slightly less than 8 per cent, is administrative, office and other management personnel.

Principal foundry occupations include the following: Chipper and grinder, 9.6 per cent; machine molder, 6.9 per cent; machine coremaker, 3.6 per cent; maintenance mechanic, 3.3 per cent; shakeout man, 2.9 per cent; hand coremaker, 1.7 per cent; ladleman, 1.6 per cent; metal patternmaker, 1.5 per cent; and maintenance electrician, 1.3 per cent. Table II shows the occupational distribution of employees in different types of foundries.

Length of Training—As indicated in Fig. 2, the lengths of time required to train workers for different occupations vary considerably. For shakeout men, for example, the median training time reported is only 1 month; for patternmakers and maintenance mechanics, however, it is 48 months.

In general, the mechanized foundries agree about the time required to train workers in certain occu-

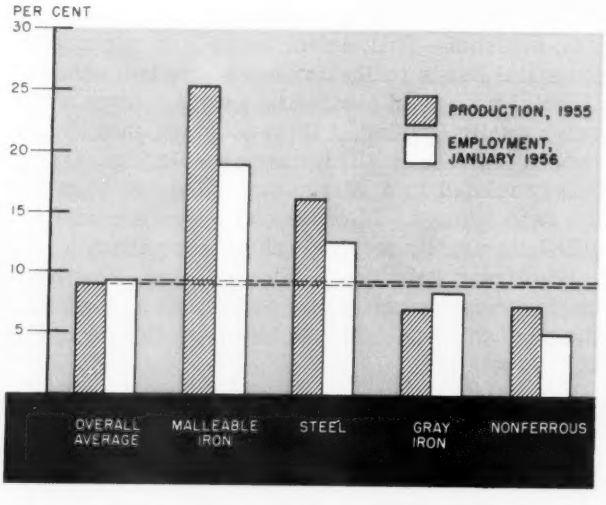


Fig. 1—Foundries studied are responsible for about 9% of foundry production and employment

TABLE I—Foundries Included in Study, by Type of Foundry and Employment

Type of Foundry	Number of Reporting Foundries	Less than 150	150-299	300-499	500-999	1000 or More
Total	41	2	8	10	12	9
Gray iron	16	2	5	4	1	4
Malleable iron	9	—	1	2	5	1
Steel	10	—	—	3	5	2
Nonferrous	6	—	2	1	1	2

pations, such as shakeout man; but there is considerable disagreement concerning the length of time required to train coremakers, machine molders, melters, hand coremakers, hand or bench molders and floor molders. To indicate the extent of this disagreement, Fig. 2 shows for each occupation the range of times reported and the point at which half of the responses fell.

Need for More Manpower—In planning the study, the industry committee recognized the importance of obtaining adequate replacements for workers who die, retire or shift to other types of employment. Such losses must be replaced if the levels of employment in the various foundry occupations are to be maintained. On the other hand, a downward trend in the need for workers in a particular occupation might make it unnecessary to replace losses in that field.

The committee agreed that to obtain a clear picture of the industry's manpower needs, detailed information was needed concerning occupational trends in mechanized foundries. Accordingly, each plant included in the study was asked to estimate how many employees it would have in various occupations in 1960. These foundries estimated an over-all employment increase of 19.5 per cent by 1960. Production of castings by these plants is expected to increase 36.7 per cent during the

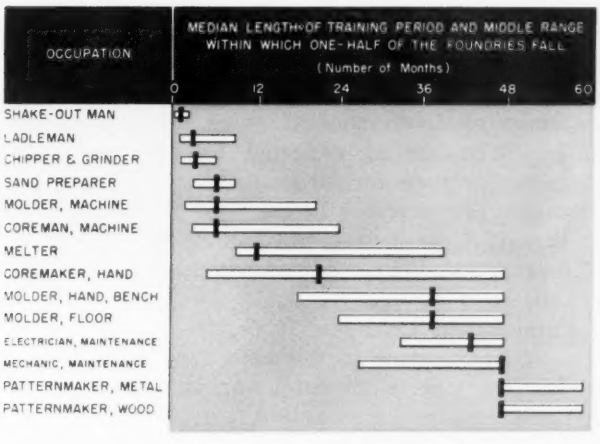


Fig. 2—Lengths of time required to train workers for different occupations vary considerably

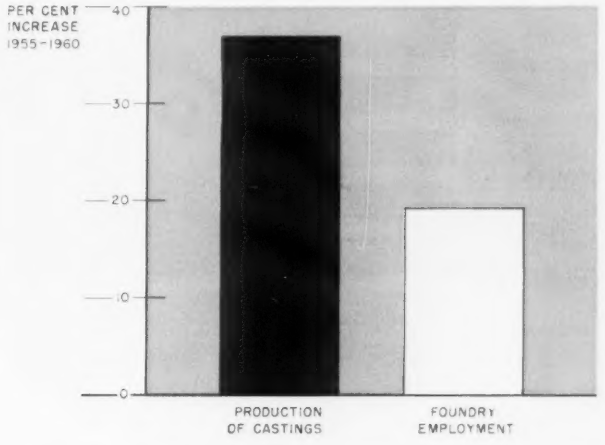


Fig. 3—Foundries studied see a 19.5% increase in employees, 36.7% increase in casting output

TABLE II—Distribution of Employment by Occupation and Type of Foundry

Occupation or Occupational Group	Total	Gray Iron	Malleable Iron	Steel	Nonferrous
			Number		
Total	32,258	14,004	5,951	7,697	4,606
			Percent		
Total	100.0	100.0	100.0	100.0	100.0
Selected service occupations:					
Electrician, maintenance	1.3	1.1	1.4	1.6	1.3
Electrician trainee, maintenance	0.1	0.2	*	—	—
Mechanic, maintenance	3.3	2.5	6.1	3.1	2.7
Mechanic trainee, maintenance	0.1	*	0.2	*	—
Patternmaker, metal	1.5	2.1	0.7	0.6	2.5
Patternmaker, wood	0.7	0.4	0.8	0.6	1.6
Patternmaker trainee	0.4	0.5	0.3	0.2	0.6
Other production workers:					
Chipper and grinder	9.6	9.4	7.1	12.8	8.0
Coremaker, hand	1.7	1.0	1.0	2.9	3.2
Coremaker, machine	3.6	5.4	3.1	1.8	1.9
Coremaker trainee	0.1	0.1	0.3	0.2	0.1
Ladleman	1.6	1.4	1.8	0.9	3.3
Melter	1.0	0.6	0.9	1.4	1.4
Molder, hand, bench	0.9	0.9	0.5	1.5	0.3
Molder, floor	0.6	0.3	0.1	1.4	0.6
Molder, machine	6.9	5.4	9.8	5.3	10.4
Molder trainee	0.3	0.1	0.8	0 6	—
Sand preparer	1.2	1.4	0.9	1.3	0.6
Shakeout man	2.9	2.9	1.3	3.6	4.2
Other trainees	0.4	0.2	0.2	0.1	1.5
Other workers (requiring little or no training)	47.1	51.4	44.3	42.9	44 2
Management group:					
Foreman (nonworking)	4.9	4.2	6.3	5.6	4.3
Engineer, metallurgist and other professional technical personnel	1.4	0.7	1.7	1.4	2.6
Technicians	0.9	0.7	1.6	0.6	1.3
Administrative and other office personnel	7.5	7.1	8.8	9.6	3.4

*Less than 0.05 per cent

same period. Fig. 3 illustrates these estimates.

Fig. 4 compares the anticipated increase of 19.5 per cent in over-all employment with the increases expected in certain occupational groups. These mechanized foundries estimate that the service group—patternmakers, maintenance mechanics and maintenance electricians—will increase considerably more than total employment. On the other hand, the operating group is expected to gain slightly less than over-all employment. Technicians and administrative personnel also are expected to increase sharply, but the number of engineers is calculated to increase only slightly more than over-all employment.

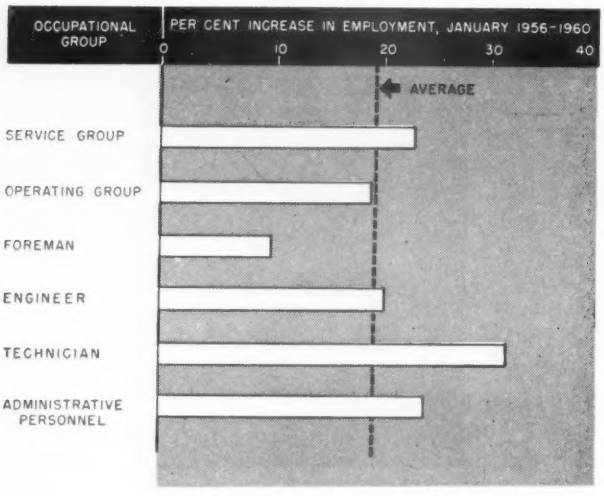


Fig. 4—Comparison of expected over-all employment increase with increases for certain jobs

Fig. 5 provides a more detailed picture of the changes expected in operating and service occupations. Sharp increases are expected in the need for maintenance electricians (30.5 per cent) and metal patternmakers (30.4 per cent). Wood patternmakers (20.5 per cent) and maintenance mechanics (17.4 per cent) also are expected to make substantial gains. The upward trend in the number of service workers required in mechanized foundries emphasizes the need to develop adequate training programs in these fields. As Fig. 2 indicated, relatively lengthy training is required for these occupations.

In contrast to the sharp increases in employment expected in the service group, most of the occupations in the operating group are expected to make relatively modest gains. Only the machine coremaker is expected to increase more than the average for all occupations. Only small increases are expected in the need for hand coremakers (2.6 per cent) and hand or bench molders (7.0 per cent). The occupational changes expected are shown in Table III.

Employment Changes, 1950-1956—The expectation of an increase in the need for certain types of workers was reinforced by an analysis of occupational trends in mechanized foundries during the last 6 years. The same occupations that are expected to make the largest gains from 1956 to

TABLE III—Percentage Change in Employment Expected between January 1956 and 1960[1]

Occupation or Occupational Group	Total (per cent)	Gray Iron (per cent)	Malleable Iron (per cent)	Steel (per cent)	Nonferrous (per cent)
Total	19.5	38.5	9.4	5.3	10.8
Selected service occupations:					
Electrician, maintenance	30.5	53.9	13.7	12.7	16.7
Electrician trainee, maintenance	100.0	109.1	0	0	0
Mechanic, maintenance	17.4	41.7	7.0	9.9	11.9
Mechanic trainee, maintenance	0	0	0	0	*
Patternmaker, metal	30.4	43.3	40.0	16.7	5.3
Patternmaker, wood	20.5	14.3	43.5	23.5	13.3
Patternmaker trainee	12.6	14.0	0	*	10.0
Other Production Workers:					
Chipper and grinder	16.9	32.3	16.7	1.2	14.5
Coremaker, hand	2.6	3.5	5.2	4.2	7.6
Coremaker, machine	25.5	38.6	8.2	14.1	9.5
Coremaker trainee	112.5	*	*	*	*
Ladleman	20.5	38.6	21.6	0	12.3
Melter	13.3	35.3	17.6	1.8	8.1
Molder, hand, bench	7.0	8.7	—8.3	5.3	9.1
Molder, floor	12.8	22.2	*	8.3	22.7
Molder, machine	18.3	39.6	18.5	10.4	6.6
Molder trainee	23.9	71.4	—4.2	*	0
Sand preparer	19.4	30.9	18.2	5.2	11.5
Shakeout man	15.2	27.1	0	7.2	11.8
Other trainees	62.5	39.6	0	*	*
Other workers (requiring little or no training)	20.2	44.0	.8	4.3	11.7
Management group:					
Foreman (nonworking)	10.0	12.2	15.4	3.0	9.0
Engineer, metallurgist and other professional technical personnel	20.8	30.0	41.1	8.9	10.3
Technicians	32.1	49.0	36.8	14.3	20.5
Administrative and other office personnel	24.4	44.1	7.8	3.8	9.4

* Percentage not computed when number of employees in base period (1956) was less than 10.

[1] Unless otherwise indicated, figures shown are percentage increases. Based on data for 27 foundries that reported occupational data for January 1956 and estimates for 1960 — 11 gray iron, 6 malleable iron, 5 steel, and 5 nonferrous foundries.

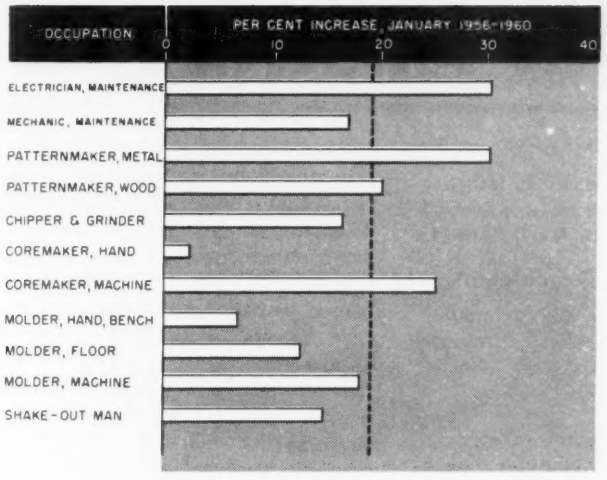


Fig. 5—Chart provides detailed picture of expected changes in operating and service workers

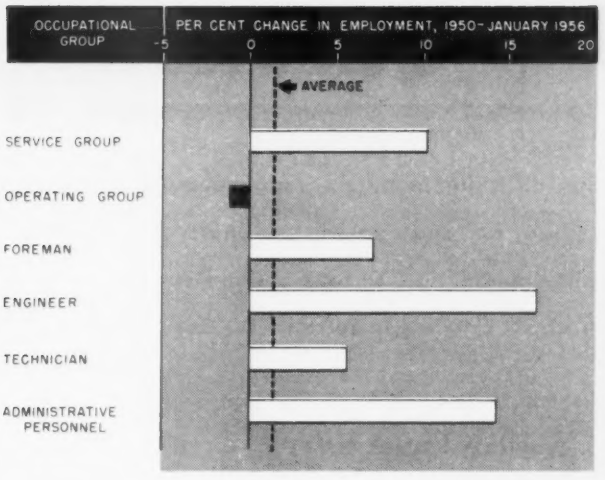


Fig. 6—Significant employment changes during the period 1950-56 are shown by this chart

1960 also experienced relatively sharp increases from 1950 to 1956. Although the mechanized foundries experienced only a 1.4 increase in employment during this period, a relatively large gain (10.2 per cent) was reported for occupations in the service group. The operating group experienced a slight decline. Contrary to the forecast for 1960, however, the number of engineers increased more rapidly than the number of technicians. A detailed tabulation of employment changes in foundries appears in Table IV.

Additional Mechanization Expected—Although the foundries included in the study already had become highly mechanized, 76 per cent of them indicated that they probably will install new and improved equipment between now and 1960. Most frequently mentioned was new molding equipment, especially for shell molding.

Additional meetings of the industry committee are planned to consider this subject further. Meanwhile the committee welcomes any comments or suggestions. Communications should be addressed to the committee chairman—Fred G. Sefing, International Nickel Co., 67 Wall St., New York 5.

TABLE IV—Percentage Change in Employment between 1950 and January 1956[1]

Occupation or Occupational Group	Total (per cent)	Gray Iron (per cent)	Malleable Iron (per cent)	Steel (per cent)	Nonferrous (per cent)
Total	1.4	−8.1	16.0	9.5	−5.8
Selected service occupations:					
Electrician, maintenance	12.3	21.1	61.8	1.0	−1.7
Electrician trainee, maintenance	*	*	*	—	—
Mechanic, maintenance	7.0	4.7	16.2	2.5	−1.6
Mechanic trainee, maintenance	*	—	*	—	—
Patternmaker, metal	8.3	10.7	18.2	0	6.2
Patternmaker, wood	0	4.3	21.1	−10.0	−3.8
Patternmaker trainee	84.6	146.2	*	*	35.3
Other production workers:					
Chipper and grinder	12.0	10.0	16.0	27.1	−10.4
Coremaker, hand	−5.9	−22.4	27.8	6.1	−5.6
Coremaker, machine	2.3	−6.1	7.3	42.0	−8.5
Coremaker trainee	16.7	*	*	*	—
Ladleman	−9.1	−20.8	13.9	23.7	−14.0
Melter	−8.1	−35.7	12.5	20.0	−3.3
Molder, hand, bench	−4.7	−5.9	0	−4.2	0
Molder, floor	−6.6	18.4	*	3.6	0
Molder, machine	−3.6	21.3	6.6	20.6	−3.4
Molder trainee	11.4	6.3	27.3	−14.3	*
Sand preparer	15.3	13.6	5.3	40.0	−3.8
Shakeout man	−17.4	39.2	12.2	12.6	17.1
Other trainees	24.0	24.0	—	—	—
Other workers (requiring little or no training)	−1.9	13.4	22.0	19.2	−13.1
Management group:					
Foreman (nonworking)	7.2	5.8	9.7	8.9	3.4
Engineer, metallurgist and other professional technical personnel	16.7	34.4	37.5	7.7	6.5
Technicians	5.7	0	22.8	10.0	−9.4
Administrative and other office personnel	14.4	14.1	17.9	16.2	3.5

* Percentage not computed when number of employees in base period (1950) was less than 10.

[1] Unless otherwise indicated, figures shown are percentage increases. Based on data for 30 foundries that reported occupational data for January 1956 and estimates for 1960 — 12 gray iron, 6 malleable iron, 7 steel, and 5 nonferrous foundries.

Questions and Answers

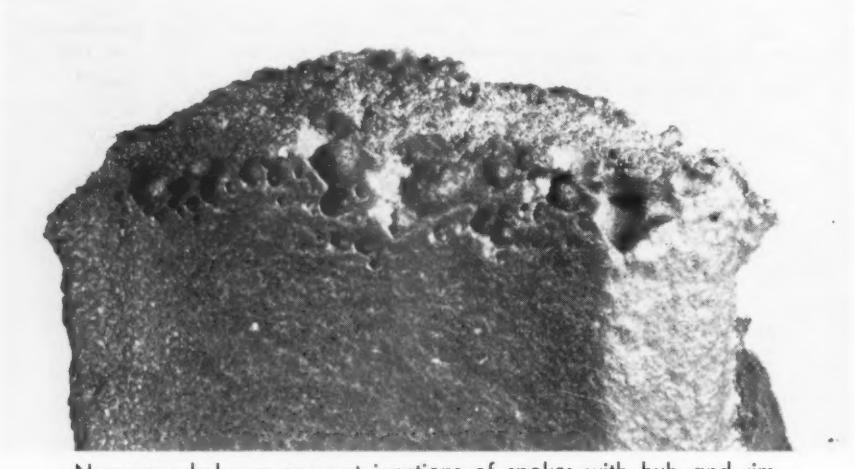
Has difficulty in making spoked pulleys without holes at juncture of hub, rim and spokes . . . Charcoal can be employed as fuel for melting iron . . . Silicate bonded sand hardens in the coreblowing machine . . . Keeps out dirt . . . Coke breakage

Gas Evolution Causes Holes

QUESTION We are forwarding separately a piece of a spoke from a cast iron pulley blank containing a defect and would like an opinion as to the cause. The pulley was about 31 in. in diam with an 11-in. face, had an 8-in. diam hub with a 4-in. core through the center. The hub was about 5½-in. deep, and thickness of the rim was about 1 in. The hub is connected to the rim by six oval spokes about 1 x 3 in., and the weight was about 440 lb. Where the spokes are attached to the rim and to the hub are, as shown by the specimen, what appear to be gas holes on both cope and drag sides. These extend to some degree up on the inside of the face and on the hub. The remainder of the pulley is sound.

ANSWER From our examination of the piece of spoke, we believe, as you indicate, that the holes appearing at the junction of the spokes with the other parts of the casting result from gas. The difficulty probably is the result of a combination of factors rather than of a single one. At the junctures of the spoke or spokes with the rim and the hub, the hot iron in contact with the sand generates steam or gases on two fronts. One is on the spokes where gases tend to flow vertically up or down and the other on the faces of the rim and hub where they tend to flow horizontally. In other words, twice as much gas is generated in these re-entrant angles of sand than along any one face, and unless it can escape readily, it strikes back into the casting cavity, causing blows.

Possibly the trouble results from ramming too hard in the junction area or from the moisture's being on the high side or from a combination of the two It may be that the sand is somewhat on the "weak" side and that the molders ram the sand hard to get away from drop-outs, stickdowns or broken edges in those particular areas. The exact answer to the problem will have to be determined by consideration of the various possibilities mentioned and by trying changes one at a time. Preferably, we would examine ramming as a start. A temporary remedy would be to use a vent wire freely.



Numerous holes appear at junctions of spokes with hub and rim

Charcoal in Cupola Melting

QUESTION We would appreciate any information on the use of charcoal as fuel for melting iron in the cupola.

ANSWER Probably the most useful description of employment of charcoal to melt iron in the cupola is that in Kirk's *The Cupola Furnace.* Describing his experience, he mentions that the cupolas were 20 and 30-in. ID and that shavings and soft wood were employed as ignition agents. The fuel bed of charcoal was placed on that material so that it rose 18 to 20 in. above the tops of the tuyeres. Customary practice was to fill the cupola with stock before lighting off and to turn on the blast as soon as the charcoal in the bed had been ignited. Kirk stated that because charcoal would not carry as heavy a burden as coal or coke, the iron charges consequently were lighter and more numerous. Blast also was lighter than for other fuels. According to Kirk, the fuel charge or split was 6 in. deep, and he indicated that when fuel and iron charges were proportioned properly, the iron was sufficiently hot to run the lightest of castings with a ratio of 3 to 4 lb iron to 1 lb of coke. Assuming that charcoal weighs about 28 lb per cu ft, the iron charges in a 20-in. cupola with a 6-in. split would range from 90 to 120 lb. In the 30-in. cupola, the iron would range from 200 to 275 lb.

Sand Hardens in Core Blower

QUESTION We have followed with interest the articles in FOUNDRY on the carbon dioxide process for core and mold making and have been successful in establishing the process for hand operation in our foundry in India. However, we are experiencing considerable difficulty in working the process on coreblowing machines. Principle trouble encountered is from the sand setting or hardening inside the machines due to reaction with atmospheric carbon dioxide from the compressed air used in operating the machines.

ANSWER While it is possible that the carbon dioxide in the compressed air may be the cause, we believe that your difficulty arises from some other source. Information available indicates that normally the atmosphere contains about 4 parts of carbon dioxide in 10,000 by volume or about 0.061 per cent by weight. Compressed to 100 psi, the air would contain about 0.43 per cent carbon dioxide by weight. With air weighing 0.0807 lb per cu ft at 32°F and 14.7 psi, a cu ft at 100 psi and 70°F would weigh about 0.474 lb, and contain 0.002 lb carbon dioxide. Gotheridge and Pursall in the March issue of FOUNDRY indicate that, theoretically, the quantity of carbon dioxide required to

complete the chemical reaction with 4 per cent silicate binder is 0.2 to 0.3 per cent of the weight of sand. Hence, the silicate-bonded sand would have to be subjected to a considerable volume of compressed air for the reaction to take place.

Therefore, you should look to other possible causes for the hardening in the hopper of the coreblowing machine. One likelihood is exposure of the sand, prior to placing in the hopper, in the CO_2 gassing vicinity without suitable protection. Another might be that the machine and its blowholes are not cleaned out thoroughly after use, resulting in partially clogged openings at the start, and eventual complete plugging after a short period of operation. Another possibility is that in mixing the sand, it is allowed to get hot which increases its tendency to air harden.

Stops Entry of Sand and Dirt

QUESTION Recently a question causing considerable debate in our foundry related to the advantages or disadvantages of placing a piece of paper over the riser. In our plant the riser usually is made higher than the flask by means of an extra head or box, and the paper is placed over the hole in the mold, followed by the box or head.

ANSWER So far as we know the one and only advantage of placing a piece of paper over a riser or sprue opening is to prevent the entrance of dirt or dust into the mold cavity. In your case, where a riser extension is employed, the precaution of placing a paper over the hole before setting the extension is a *must* since some of the sand on top of the mold or on the bottom of the extension usually will be disturbed when the latter is being set in position. Without the protection of the paper that loose sand would fall into the mold cavity and later probably would cause a defective casting.

Bronze Seats in Iron Valves

QUESTION Some time ago we saw a reference to the methods employed in mounting or placing bronze seats in cast iron gate valves, but we cannot locate it. Can you give us information on how it is accomplished?

ANSWER Bronze seats may be mounted in iron gate valves in several different ways. One is to use a machined bronze seat which is screwed into the iron body or pressed in with a tongue and groove. Another procedure is to place the bronze ring on the core and to cast the iron body around it. After partial machining, the bronze is rolled or pressed to insure a tight joint. Still another practice is to machine the ring or seat and then roll it into place.

Tread of Wheel Is Defective

QUESTION We have started making a carwheel with a solid disk web similar to a railroad wheel, except that it is smaller, weighing from 60 to 90 lb, and are having difficulty in keeping the chilled treads free from imperfections. These imperfections look like sand and slag combinations—mainly sand—despite all efforts to keep the molds clean. Each ladle of iron is skimmed before pouring to keep the iron clean. Chills are painted with a coat of kerosene and closed up as the molds are made. The gate is on the hub, and the iron is poured as quickly as possible into the mold. We seem to be able to keep our spoked wheels clean, but not the disk wheels.

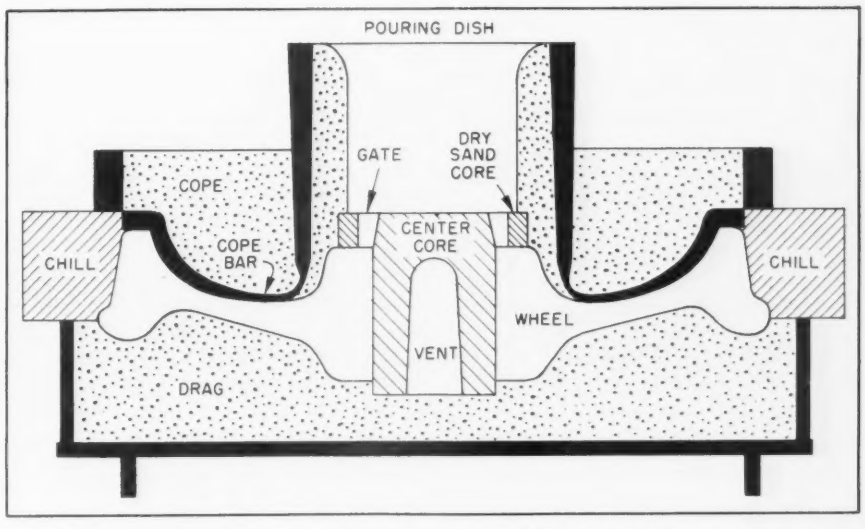
ANSWER Although you mention that you are gating into the hub of the wheels, you do not describe the type of gate used, and possibly by following the procedure of the carwheel makers you may be able to overcome the difficulty. In that practice a circular, ring-type dry sand core containing a number of holes sets on the hub core, beneath the pouring dish or basin. The method is indicated in the accompanying sketch. In your case, four holes about ½-in. in diam, spaced equidistantly circumferentially, should serve.

Possibly your trouble may arise from a sand condition. In other words, the sand may be cut or washed by the flow of iron. You might examine the wheels and observe whether small lumps appear on the areas made in sand, particularly along edges. Those indicate sand breakage.

Trouble With Lining Burnout

QUESTION Recently we had to buy a new blower for our 56-in. OD cupola because the old one had worn out. The old one, a displacement-type, was 30 ft from the cupola and gave satisfactory service. The new, centrifugal-type blower is only 4 ft from the cupola and is causing very bad burnout of the lining. Both blowers operate at 8-oz pressure. Does the distance from the cupola cause the trouble?

ANSWER We do not believe that the distance between cupola and blower has any bearing on your problem, but it may indirectly have an effect due to the method of attaching the blast pipe to the windbox. If the connection is perpendicular, or at an angle of 90 degrees, then the tuyeres opposite the entrance will receive the most air and cause the high burnout. The blast pipe attachment should be at a tangent to provide good distribution. Placing baffles immediately in



Gate core fitted on top of center core contains holes for metal entry

front of the pipe or partially blocking off the tuyeres in that area will help to overcome the trouble.

We suspect, however, that the actual difficulty lies in the volume of air supplied. That is to say that the new blower supplies much more air than the old one, even though the operating pressure may be the same. A 56-in. shell lined to 42 in. will melt from 6 to 7 tons per hour and require about 3100 cu ft of air per minute. Information on the capacity of the blower may be secured from the manufacturer, and if it is much higher than the figure given, you might try reducing the volume by insertion of a blast gate between blower and cupola.

Suggests a Change in Gating

QUESTION We are sending you some fractured pieces of small globe valves with which we are having leakage difficulty at the seat section, and you will note the coarse, yellowish structure in that area. Can you suggest how the trouble can be overcome?

ANSWER The coarse, yellowish structure shown in the defective valves is the result of shrinkage, and we believe that a change in gating will overcome the difficulty. Examination of the specimens sent to us indicates that the valves are gated into the end opposite that where the seat section joins the body so that the metal has to flow some distance before entering the seat portion. The section through which the metal flows is thin and freezes off before the seat section does. We believe that if the gate is changed so that the metal flows directly into the seat section as well as into the body, suitable feeding will be accomplished.

Determining Breakage of Coke

QUESTION We have seen references to the shatter test for determining the ability of coke to withstand breakage during handling and would like some information on the procedure.

ANSWER Complete details of the method employed for the drop shatter test for coke are described in ASTM standard specification D 141-48, which may be obtained from the American Society for Testing Materials, 1916 Race St, Philadelphia 3, for 30 cents. Essentially, the procedure is to place a 50-lb sample in a box 18 x 25 x 15 in. with a hinged bottom. The box is mounted 6 ft above a rigid steel or cast iron plate. Coke is dropped from the box onto the plate four times, and all the material is placed back in the box after each of the first three drops. After the fourth drop, the material is screened in a series of square-mesh sieves of 2, 1½, 1 and ½-in. sizes. Material retained on each of the sieves is tabulated to measure the ability of the coke to withstand breakage.

Methods for Plating Patterns

QUESTION We have been making sprocket wheels from loose patterns from time to time, but now have an order for an appreciable quantity of one size, and we believe it will be to our advantage to plate the pattern. We hesitate to do so, however, since we do not know how it should be gated. Can you suggest a suitable method so that we can run the job on a molding machine?

ANSWER The pattern for the sprocket wheel may be mounted in either of two ways. In one procedure, one-half of the existing pattern is molded and cast. The casting is hand finished if required, then attached to a flat pattern plate of steel, cast iron, aluminum, etc., by bolts or screws. In attaching the half pattern to the plate, you must use great care so that it is in the exact center. With a symmetrical pattern, the copes and drags are made from the same pattern. If the pattern is not centered exactly on the plate, the mold cavities will not match and will result in shifts.

The more popular method is to make pattern and plate as an integral unit. As in the first instance, one-half of the pattern is molded, but the flask must be large enough to include the area for the plate. The cope is rammed and lifted off. Wooden strips the thickness of the proposed plate are laid or tacked to the joint of the drag. A light wood frame or templet with a pin lug at each end is placed on the joint so that the half wood pattern is in the exact center. Space between the inside of the strips and the outside of the templet on the joint is packed with sand, and the surplus sand is removed to form a new flat support for the cope. The templet and half-wheel pattern are removed and the mold closed and filled with metal, usually an aluminum alloy. The mold may be gated at the end, side or top. As far as gating the new plated pattern is concerned, the usual procedure is to place the gate on top of the hub.

It should be pointed out that these procedures will provide castings somewhat smaller, than those obtained from the original patterns since an additional shrinkage is involved. If close tolerances are called for on the sprocket dimensions, a more involved method will have to be used. The half wood pattern will have to to be invested first in medium-expansion plaster which will provide a cavity larger than the size of the pattern dimensions. By proper control, the enlargement will equal the contraction or shrinkage which occurs when the final pattern is made in metal. The cavity obtained then is filled with regular plaster, and the plaster cast obtained forms the pattern, which is molded as earlier described. The resulting metal pattern will be the same size as the present wood pattern.

Chill Depth Not Sufficient

QUESTION We are making a hollow cast iron trunnion which must have a chill depth of ¼-in. or more on the exterior surface. Casting is 15 in. OD, 6 in. ID, and 5 in. long and must be free from any surface defects. We are using a chill 6 in. thick, but only are able to secure a chill about ⅛-in. deep.

ANSWER With the chill ring you mention, you should be able to secure a much deeper chill on the face of the casting than you mention, and we suspect the difficulty is due to the composition of the iron being poured. It probably is the same composition as used for your regular production and is not suitable for 4½-in. sections. Presumably you have only a few of those to make each day, a condition which hardly warrants changing the iron mixture to provide the desired composition.

Possibly you could accomplish the desired results by a ladle addition of chromium in sufficient quantity to offset the graphitizing effect of the higher silicon content in your present mixture. Without knowledge of your present composition, we cannot suggest how much chromium to add, but you can ascertain the amount by considering that 1 part of chromium will counteract the effect of 1½ parts silicon. In other words if your present silicon is 2 per cent against the 1 per cent desired, you have an excess of 1 per cent. That will require an addition of 0.66 per cent chromium, or 15 oz of 70 per cent ferrochromium per 100 lb of iron.

Another method would be to coat the chill with a dilute tellurium paste or to add tellurium to the molten iron. Tellurium is a potent carbide stabilizer, and very small amounts are extremely effective. We would not add over 0.1 per cent, or 1.6 oz per 100 lb iron.

Better Sand Fewer Manhours with The Royer SANDHOG

5 Big Features

1. **HYDRAULIC PROPULSION**—No Shock or Overload, Damage, Variable Speeds up to 85 ft./Minute, Instantaneous Reverse.
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With the Royer SAND HOG, one man operating one machine performs a complete sand conditioning operation. This self-propelled, self-loading unit gives you entirely mechanized sand preparation. Moving into the sand heap by its own power, it scoops up, completely conditions and discharges from 40 to 60 tons of molding sand per hour. In one simple, rapid operation the sand is thoroughly mixed and blended with even distribution of moisture and aerated twice. Built-in magnetic separation removes all scrap, nails and shot, eliminating the need for further riddling.

Write for detailed information on this self-contained machine.

5 Big Savings

1. **LESS EQUIPMENT**—To Purchase, Operate & Maintain.
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3. **FEWER MAN HOURS** — A One Man Sand Conditioning Operation.
4. **BETTER SAND**—Magnetically Cleaned, Properly Mixed, Blended and Aerated.
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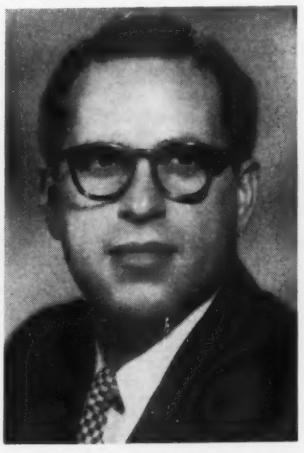
Men of Industry

J. E. REHDER
. . . Canadian foundry v. p.

EDWARD C. WILLIAMS JR.
. . . joins Wellman Bronze



EDWARD J. VARGO
. . . named plant manager

ARTHUR J. KARAM
. . . manufacturing supt.

J. E. REHDER, director, technology and research, Canada Iron Foundries Ltd., Montreal, has been made a vice president of the company. A graduate of McGill University, Mr. Rehder from 1944-1947 was chief metallurgist, Grinnell Co. of Canada Ltd., covering its Toronto and Oshawa, Ont., plants. In 1947, he became foundry metallurgist in charge of the experimental foundry for the Department of Mines and Technical Surveys of the Canadian government in Ottawa, Ont. He joined Canada Iron Foundries in 1952. He was awarded the Peter L. Simpson Gold Medal of the American Foundrymen's Society in 1955 for outstanding contributions to the society and to the foundry knowledge of cast metals.

Martin J. O'Brien Jr., until recently general manager, Atlas Foundry & Machine Co., Tacoma, Wash., has been named manager-manufacturing engineering for General Electric Co.'s foundries in Everett and Lynn, Mass. Previous associations include Vulcan Iron Works, Wilkes-Barre, Pa., and Symington Gould Corp., Depew, N. Y. Mr. O'Brien is a former chairman of the Western New York Chapter of the AFS and also served as a national director of the society.

Wallis W. Wood was appointed plant manager of the Greensburg, Ind., plant, Bohn Aluminum & Brass Corp., Detroit. He was formerly assistant works manager, Cleveland Graphite Bronze Division of Clevite Corp., Cleveland.

Edward C. Williams Jr. was appointed manager of customer relations, Wellman Bronze & Aluminum Co., Cleveland. A graduate of John Carroll University, Mr. Williams was formerly with Alloy Precision Castings Co., Cleveland, as sales service manager.

Edward J. Vargo, formerly chief metallurgist, Alloy Precision Castings Co., Cleveland, was recently named plant manager. He is a graduate of Case Institute of Technology.

Jules J. Henry, formerly director of quality control, Forest City Foundries Co., Cleveland, was appointed foundry superintendent, Marion Machine Foundry & Supply Co., Marion, Ind. A graduate of Case Institute of Technology, Mr. Henry has presented talks before various AFS groups on cast iron techniques and quality control.

Kenneth M. Smith, foundry consultant, has established headquarters at 541 Ridge Rd., Wilmette, Ill., serving foundries east of the Mississippi river. Mr. Smith specializes in foundry technical problems and statistical quality control, the latter applying to all types of foundries.

Charles Cury, director of Societe Cury et Charrier, Deville, Ardennes, France, recently was elected president of the Association Technique de Fonderie, Paris, succeeding **Gustave Rivoire. Jean Laine,** director of the Ecole Superieure de Fonderie, was elected first vice president. Mr. Cury's father, the late Jules Cury, was a former president of the association. Charles Cury is the originator of the fluidity test which bears his name.

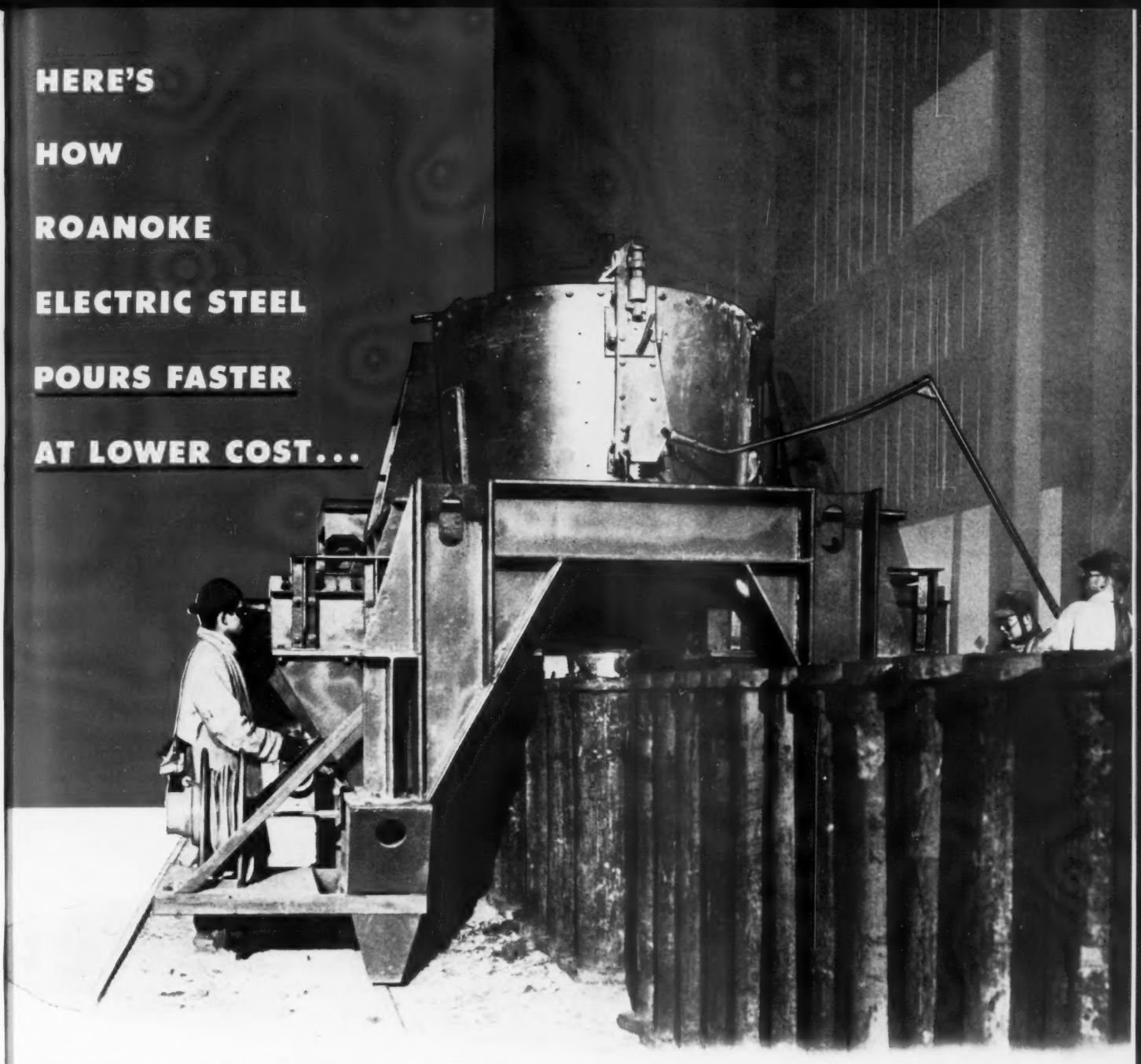
Arthur J. Karam was appointed manufacturing superintendent, Saginaw Malleable Iron Plant, Central Foundry Division, General Motors Corp., Saginaw, Mich. He succeeds **Thomas R. Wiltse,** who was recently selected as a Sloan Fellow in the executive development program at Massachusetts Institute of Technology, where he will spend a year at the School of Industrial Management. Since joining the division in 1947, Mr. Karam served at the Saginaw and Danville, Ill., plants, and last year became superintendent at the Defiance, O., plant. Mr. Wiltse was graduated from General Motors Institute in 1951.

Dr. G. V. Slottman, vice president-research and engineering, Air Reduction Co., New York, was presented the Morehead Medal of the International Acetylene Association at its recent annual convention. Dr. Slottman was awarded the medal in recognition of his scientific contributions to carbide, acetylene and oxygen technology.

Robert Coady, for the past 10 years chief metallurgist and plant engineer, Hoosier Iron Works Inc., Kokomo, Ind., was appointed sales engineer, Indiana Products Co., Kokomo, with headquarters in Indianapolis. Mr. Coady was graduated from

Facing Page—ITEM 611→

HERE'S HOW ROANOKE ELECTRIC STEEL POURS FASTER AT LOWER COST...



Faster pouring of ingot molds at lower cost! That's what a Whiting special ladle transfer car is doing at the Roanoke Electric Steel Corporation plant at Roanoke, Virginia.

Two rows of ingot molds are set up on the floor. The transfer car on tracks with the large Whiting ladle is electrically operated to pass back and forth over the molds. The ladle is mounted in standards with filler blocks to position it at two elevations and thus accommodate two mold heights. The standards are mounted on roller conveyors with a manually operated racking device for lateral positioning to either of the two rows of molds. One operator directs the pouring spout and another man on the opposite side of the car controls the flow of the metal affording a coordinated operation that is fast and efficient. Not only does this installation speed pouring, but it reduces pouring costs as well.

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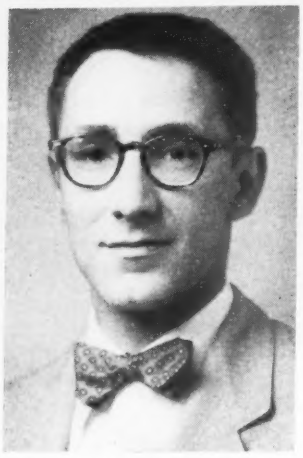
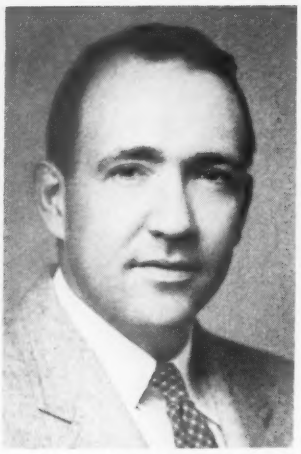
LADLE CARS

MEN OF INDUSTRY

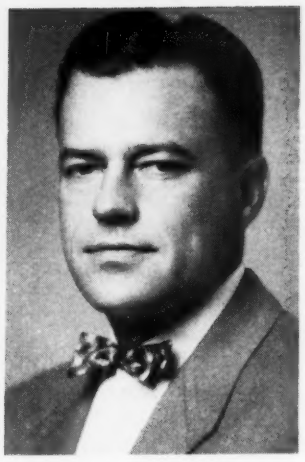


JOHN H. CULLING
. . . Carondelet Foundry v. p.



WARREN W. BROWN
. . . becomes sales v. p.

ROY A. JACOBSEN
. . . becomes executive v. p.



MILTON W. STANZE
. . . secretary-treasurer

Purdue University and was previously associated with Continental Steel Corp., Kokomo. He is a former director of the Central Indiana Chapter of the American Foundrymen's Society.

Roy A. Jacobsen was elected executive vice president, Carondelet Foundry Co., St. Louis. With the company since 1930, first in a sales capacity, and later as foundry manager, he became a director and vice president in 1941. Mr. Jacobsen was the first chairman of the St. Louis Foundrymen's Association, now a chapter of the AFS. **John H. Culling** has been named Carondelet's vice president in charge of operations, with particular attention to production and application of high-alloy iron and steel castings. Works manager for the past year, Mr. Culling joined the company after graduation from Purdue University in 1947. **Warren W. Brown,** who has been sales manager since 1954, has been made vice president-sales. A graduate of DePauw University, he joined the company in 1946. **Milton W. Stanze,** formerly treasurer and a director, was elected secretary-treasurer. He is a graduate of Washington University.

Bart A. Rossfeld, formerly assistant vice president, was appointed vice president, National Bearing Division, American Brake Shoe Co., St. Louis. He joined the company in 1923 and has held various production and administrative positions, including assistant division works manager. **Albert L. Hunt** was named general manager of the division's St. Louis plant. Mr. Hunt has been with the division since 1936, became plant superintendent in 1942, general superintendent of foundries in 1951, and was named manager of industrial sales in 1952.

J. H. Bertrand recently joined the Chicago office of Lester B. Knight & Associates Inc., as manager of plant engineering. A graduate of University of Montreal, Mr. Bertrand's former connections have been with Canadian foundries.

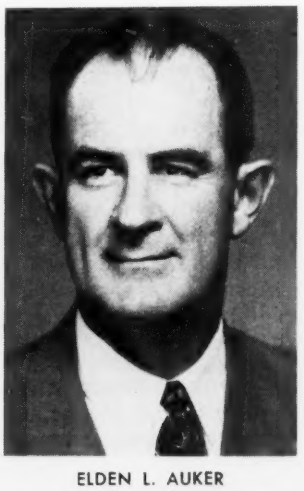
Earl C. Hughes was named executive vice president, **Elden L. Auker,** vice president-sales, **Harold G. Clayton,** vice president - manufacturing, and **Arthur E. Gilman,** treasurer, Bay State Abrasive Products Co., Westboro, Mass. Mr. Hughes, formerly vice president, continues as company secretary. Prior to joining Bay State in 1936 he was associated with Norton Co., Worcester, Mass., as assistant sales manager. He is a former president and board chairman of the Grinding Wheel Institute. Mr. Auker, who played professional baseball until 1942, was Detroit district manager after becoming associated with the company in 1949 and until recently was sales manager. Mr. Clayton, formerly factory manager, has been with Bay State for 16 years. Mr. Gilman, who has been assistant treasurer, joined the company in 1941.

Fred P. Biggs, chairman, and **George E. Anne,** vice president, Brake Shoe & Castings Division, American

ALBERT L. HUNT
. . . Brake Shoe plant mgr.

J. H. BERTRAND
. . . joins Lester B. Knight

EARL C. HUGHES
. . . becomes executive v. p.



ELDEN L. AUKER
. . . Bay State Abrasive v. p.

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RELIABLE SERVICE to your foundry?

From planning to installation . . . $50,000 to $600,000 jobs . . . these foundries found Newaygo Service as reliable as Newaygo Equipment for efficient, low-cost sand handling . . .

"I want to thank you for the way you handled our order A-22170. This kind of cooperation is really appreciated.

"Buying parts today is a simple transaction. Getting them in the plant and operating is a different story and the only way this is possible, is by dealing with people like you. Thanks again."

Barnes MANUFACTURING CO. MANSFIELD, OHIO

Domestic Water Systems • Self Priming Centrifugal Pumps • Plumbing Brass Goods

July 20, 1955

Newaygo Engineering Co.
Newaygo, Michigan

Attention: Mr. Ferguson

Gentlemen:

I want to thank you for the way you handled our order A-22170. This kind of cooperation is really appreciated.

Buying parts today is a simple transaction. Getting them in the plant and operating is a different story and the only way this is possible, is by dealing with people like you. Thanks again.

Yours very truly,
Paul Barnes
BARNES MANUFACTURING CO.
Purchasing Dept.

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MOST COMPLETE LINE OF CAST IRON HEATING BOILERS IN THE WORLD
GENERAL OFFICES AND PLANT WESTFIELD, MASSACHUSETTS

September 22, 1955
Our 102nd Year

Newaygo Engineering Company
Newaygo, Michigan
Attention: Mr. M. J. Bell,
President & General Manager

Gentlemen:

Recently your company completed an installation of sand conditioning and handling equipment in our foundry.

We would like at this time to compliment you on the way you handled the entire job. As you know, when we placed this contract with you, we stressed that quick delivery was mandatory in order that we could get into production on schedule for our 1955 rush season. You kept that promise in every way and we are very pleased with your entire installation; not only the equipment but the promptness with which you shipped it, and the very co-operative and workmanlike manner that your erection crew accomplished the installation in the specified time.

We are

Very truly yours,
THE H. B. SMITH CO., INC.
J. A. Ferguson
P. A. Ferguson-President

PAF:vbc

"... You kept that promise in every way and we are very pleased with your entire installation; not only the equipment but the promptness with which you shipped it, and the very co-operative and workmanlike manner that your erection crew accomplished the installation in the specified time."

A copy of "Planned Mechanization for Foundries" is yours for the asking. Write, wire, or phone

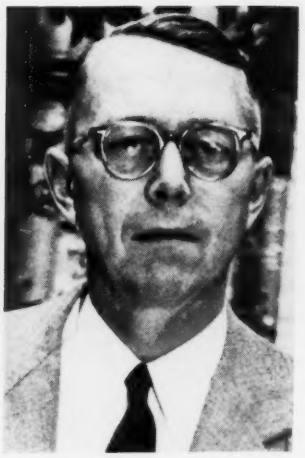
NEWAYGO engineering company
NEWAYGO, MICHIGAN

Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

JOHN B. GIRDLER
. . . becomes assistant v. p.

RAYMOND H. FILSINGER JR.
. . . corporation sales mgr.

GEORGE W. JOHNSON
. . . heads new division



HOWARD H. WILDER
. . . Vanadium engineering sales

Brake Shoe Co., New York, retired recently. Mr. Biggs joined the division in 1916 as a sales inspector. He became vice president-sales in 1944, president in 1950 and was made division chairman last year. Mr. Anne has been with Brake Shoe since 1925. A graduate of Pennsylvania State College, he was appointed assistant vice president of the Brake Shoe & Castings Division in 1953 and vice president a year later.

John B. Girdler was elected assistant vice president, Vanadium Corp. of America, New York, and will fill the newly created position of general manager of sales. **Raymond H. Filsinger Jr.,** formerly Pittsburgh district manager, has succeeded Mr. Girdler as corporation sales manager. **Roy F. Hancock,** assistant vice president, will head a new sales promotion division. **George W. Johnson,** former manager of the Steel Foundry Division, heads a new division which consolidates the former Steel Foundry and Iron Foundry Divisions. **Howard H. Wilder,** who was manager of the Iron Foundry Division, has been appointed assistant manager of engineering sales.

Charles W. Glunk was appointed chief ceramic engineer, A. P. Green Fire Brick Co. Ltd., Toronto, Ont. A graduate of Purdue University, he was formerly district sales manager in Richmond, Va., for the Green company. **Charles G. Perry,** recently sales manager of A. P. Green Fire Brick Co. of Texas, in Houston, succeeds Mr. Glunk in Richmond.

William I. Matthes, executive vice president, Arwood Precision Casting Corp., Brooklyn, N. Y., has been elected a director of the Investment Casting Institute, Chicago. He has been associated with Arwood for 11 years.

Harry C. Ahl recently joined Samuel Greenfield Co., Buffalo, as technical director. He was formerly project engineer, National Bearing Division, American Brake Shoe Co., Meadville, Pa. Mr. Ahl is chairman of the Brass and Bronze Division of the American Foundrymen's Society.

J. S. Peterson has been appointed manager of electronic sales, Scale Division, Fairbanks, Morse & Co., Chicago. He returns to the company after an absence of a number of years with other companies in the scale industry. His duties will center around the advancement of the company's scales in the electronic weighing field.

Norbert J. Gross, formerly general foreman on first-shift operations, Belle City Malleable Iron Co., Racine, Wis., was named assistant superintendent on the second shift.

Ward Dougherty has resumed the post of export manager, Machine Division, Osborn Mfg. Co., Cleveland. Mr. Dougherty held the position for 5 years until 1950, when he was appointed sales engineer for the division's southern and midwest territories. In Europe he will investigate

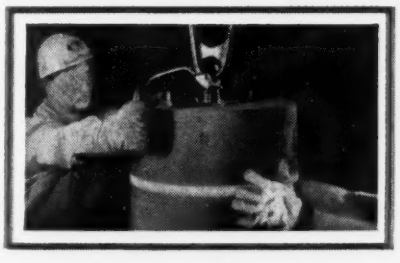
CHARLES G. PERRY
. . . district sales mgr.

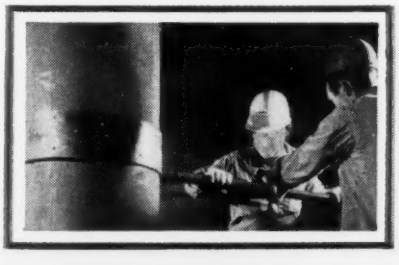
CHARLES W. GLUNK
. . . chief ceramic engineer

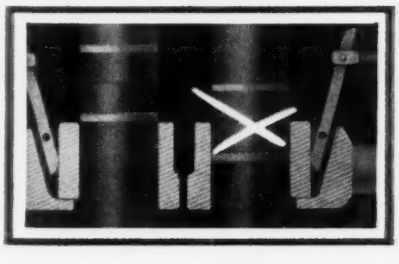
HARRY C. AHL
. . . technical director

WARD DOUGHERTY
. . . Osborn Mfg. export mgr.

MAKE A DATE WITH SAVINGS...







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new electrode shop training program

Here's a must for operating, supervisory, purchasing and management personnel . . . any one concerned with the procurement, storage, handling or use of electrodes. It's available free — in your own plant or any other mutually convenient location. Thorough coverage of the manufacturer's recommendations for proper electrode usage . . . illustration and demonstration drive home the fundamentals of good electrode practice . . . help you get top value from every electrode dollar.

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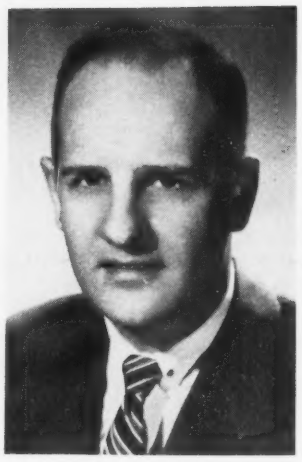
JOHN H. ABBOTT
. . . retires, Hickman-Williams

A. VERNON CARLSON
. . . becomes project engineer



E. E. McVEIGH
. . . sales engineering mgr.

H. D. McLEESE
. . . Metal & Thermit v. p.

newly created opportunities for recently developed automatic and semi-automated foundry equipment. **Richard Garrick** will assist Mr. Dougherty from the Cleveland office by handling foreign sales service.

John H. Abbott recently retired from Hickman, Williams & Co., Chicago, after 26 years as resident manager of the home office there. He attended Williams College and University of Wisconsin and was associated with Illinois Steel Co., Chicago now U. S. Steel Corp., from 1918 until he joined Hickman, Williams in 1925. **Robert C. Johnston** has succeeded Mr. Abbott as Chicago resident manager. Mr. Johnston was graduated from Cornell University and worked in the blast furnace department of U. S. Steel Corp., Gary, Ind., until 1949 when he became associated with Hickman, Williams & Co. as a member of the sales staff.

Robert C. Staudt, formerly a research engineer for the National Advisory Committee for Aeronautics, recently joined Planet Corp., Lansing, Mich., as sales engineer in the eastern district with headquarters in Akron.

A. Vernon Carlson, recently with the American Foundrymen's Society on the staff of *Modern Castings* has joined Hardinge Mfg. Co., York, Pa. As project engineer he will be engaged in the improvement of foundry processes and facilities. While attending General Motors Institute he was associated with GMC's Buick Motor Division and after graduation was shop contact man for the foundry metallurgical laboratory there. Later, while studying for his master's degree at Michigan State College, he was mechanical technician in the Mechanical Engineering Department's foundry laboratory.

J. D. Holtzapple, formerly director of training and safety, Continental Foundry & Machine Co., was appointed director of safety for Blaw-Knox Co., Pittsburgh, which acquired Continental last year. He joined Continental Foundry in 1942.

John A. Matousek has been named assistant to the president, Baker-Raulang Co., Cleveland. A graduate of Notre Dame University, he joined the company in 1950 as plant manager.

E. E. McVeigh recently was named manager of sales engineering, Baker-Raulang Co., Cleveland. Mr. McVeigh attended Kenyon College and Case Institute of Technology. Since joining Baker-Raulang in 1940 he has been engaged in field engineering and sales work.

H. D. McLeese was elected a vice president, Metal & Thermit Corp., Rahway, N. J., and will continue as general sales manager, a position he has held for the past year. He is also a vice president of Metal & Thermit-United Chromium of Canada Ltd., Toronto, Ont.

Clyde L. Pinkston has been appointed field director, Foundry Educational Foundation, Cleveland. He attended University of Washington

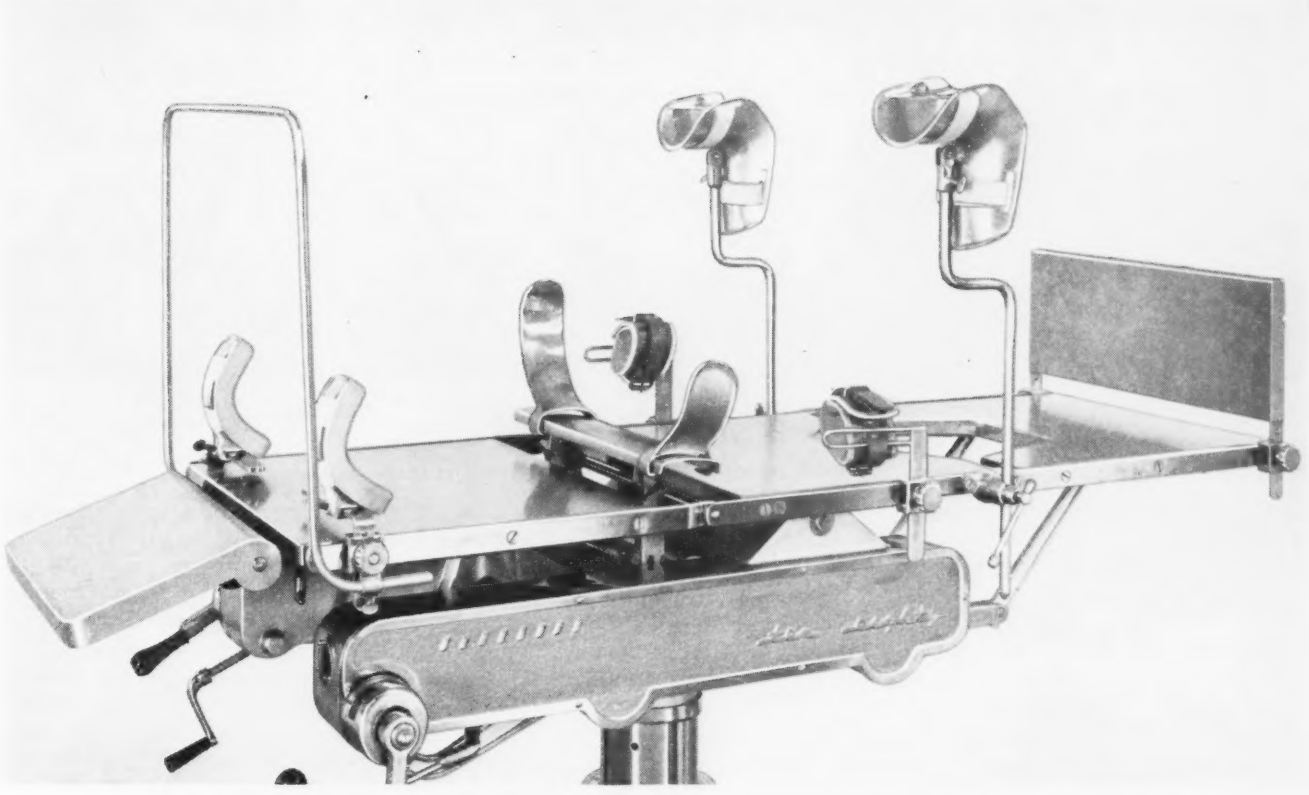
ROBERT C. STAUDT
. . . joins Planet Corp.

J. D. HOLTZAPPLE
. . . Blaw-Knox safety director

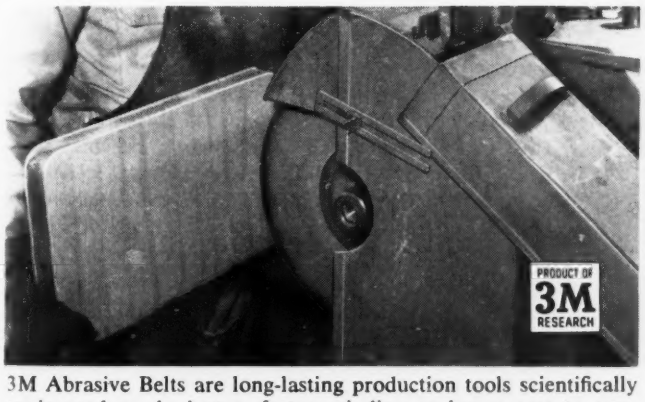
JOHN A. MATOUSEK
. . . execu'ive assistant

CLYDE L. PINKSTON
. . . FEF field director

3M METHOD–better from start to finish



3M Abrasive Belts increase production 25% on finishing of surgical table parts



3M Abrasive Belts are long-lasting production tools scientifically engineered to do better, faster grinding at lower cost to you.

American Sterilizer Co., Erie, Pa., made this saving when they switched to the Abrasive Belt Method for removing nibs, burrs and other imperfections from brass and aluminum castings. This company formerly used set-up wheels – a slow, costly method. When they switched to the 3M Method using Three-M-ite Resin Bond Cloth Belts, production on all the above castings jumped 25% with far superior pre-plating finishes. The 3M Method can help *you* increase production and cut costs in *your* foundry. Call your 3M Representative *today* or send coupon below.

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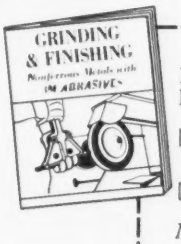

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3M COMPANY

MEN OF INDUSTRY

EARL J. BILLER
. . . heads Pittsburgh Chapter

ERNIE CLELAND
. . . joins Dike-O-Seal

JOHN G. FRISCHKORN
. . . district sales mgr.

GEORGE W. ANDRE
. . . refractories sales

and was graduated from Kent State University. Mr. Pinkston was formerly a regional manager, Davey Compressor Co., Kent, O.

Earl J. Biller, who has been named president of the Pittsburgh Chapter of the AFS for the coming year, since 1950 has been general superintendent, Vulcan Mold & Iron Co., Latrobe, Pa. He was graduated from St. Vincent College, Latrobe, in 1936 and joined Vulcan Mold at that time. He worked in the purchasing and personnel departments prior to entering the foundry. Mr. Biller was vice president of the Pittsburgh Chapter last year.

E. R. Hinton was elected chairman of the board of directors, Olympic Steel Works, Seattle. With the company for 38 years, he formerly served as vice president, president and general manager. **William M. Flint,** for the last 3 years vice president and works manager, was named president and general manager. He has been with Olympic for 18 years. **Mrs. C. W. Thede** was elected secretary-treasurer.

Maurice F. Garwood, chief materials engineer, Chrysler Corp., Detroit, recently received the professional degree of metallurgical engineer from Ohio State University, "in recognition of engineering ability and accomplishments of a high order." Mr. Garwood was graduated from the university in 1933.

W. T. McGinnis has been elected a vice president, Keokuk Electro-Metals Co., Keokuk, Iowa, and continues as assistant to the president and a director. **Donald F. Brookland,** formerly manager of operations, was named vice president in charge of operations.

Ernie Cleland has joined Dike-O-Seal Inc., Chicago, as midwestern and Canadian sales engineer. He was formerly foundry superintendent, Whitewater Mfg. Co., Whitewater, Wis., and Acme Aluminum Foundry Co., Chicago.

John G. Frischkorn was appointed district sales manager, Cleveland Tramrail Division, Cleveland Crane & Engineering Co., Wickliffe, O., in parts of West Virginia, Pennsylvania, New York and eastern Canada. He has been with the company for 16 years.

Dr. Robert J. Anderson was appointed director of research and development, Diamond Metal Co., Houston, Tex. He recently resigned as head of the Department of Metallurgy, Southwest Research Institute, San Antonio, where he served for the past 5 years.

Charles D. Cummins, since 1949 assistant district manager, was named district manager of the Seattle office, Worthington Corp., Harrison, N. J. He succeeds **E. D. Schively** who has accepted a special assignment in the company's new Canadian operation.

Lucien R. Greif recently established Greif-Associates Inc., engineering and industrial publicity, with offices at 570 Fifth Ave., New York 19. Mr. Greif recently resigned as director of industrial press relations at Jones & Brakely Inc., New York.

Arthur L. Rakestraw, Chicago field engineer, Norton Co., Worcester, Mass., has retired. A member of the Norton organization for 28 years, he was assigned to the Chicago district office during most of this time.

George W. Andre was appointed sales representative, Ironton Fire Brick Co., Ironton, O., to handle the company's refractories in Florida, Georgia and South Carolina.

R. A. Entringer, formerly general sales manager, Alcaloy Inc., Trenton, N. J., was named general manager. A graduate of Marquette University, he was previously in the metallurgical departments of Ampco Metal Inc., Milwaukee, Ladish Drop Forge Co., Cudahy, Wis., and Cleveland Forging Division, Aluminum Co. of America, Cleveland. He was also associated in sales with Claud S. Gordon Co., Cleveland, and J. T. Baker Chemical Co., Phillipsburg, N. J.

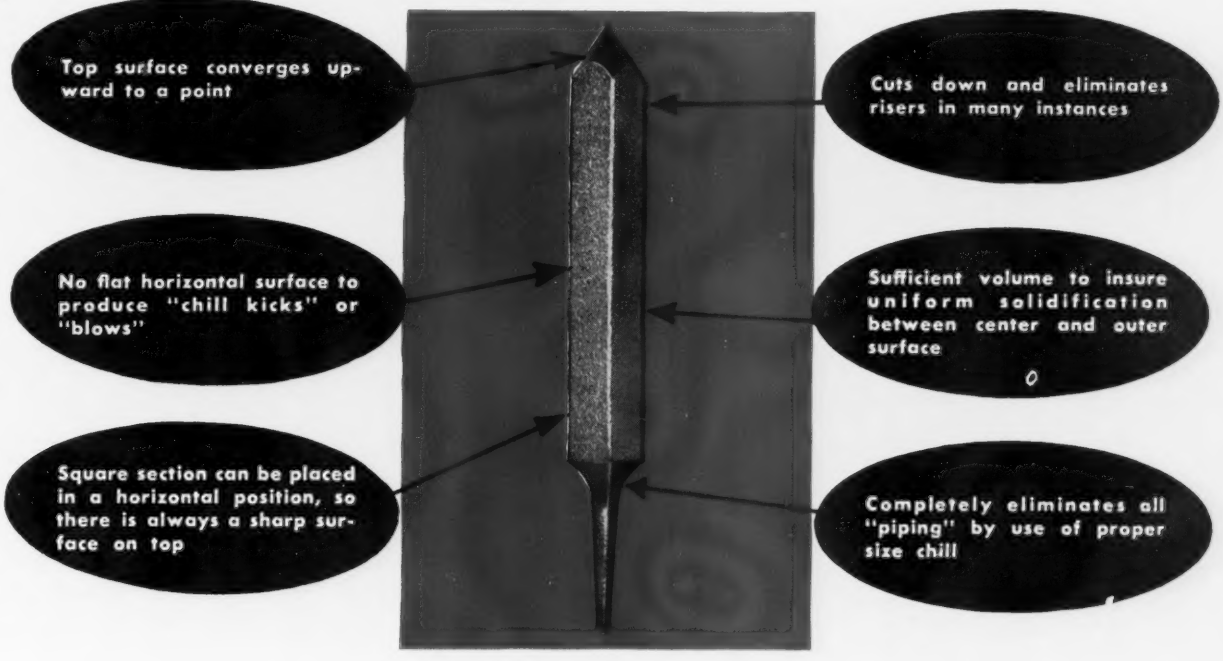
William H. Muchnic, president, Locomotive Finished Materials Co., Atchison, Kans., which recently became a division of Rockwell Mfg. Co., Pittsburgh, has been elected a director of Rockwell. A graduate of University of Kansas, he joined LFM in 1946 as a plant engineer, became assistant to the president in 1948 and president in 1952. Mr. Muchnic is a director of Steel Founders' Society of America.

Henry R. Dansereau was named district sales manager in Nevada and northwest California for the Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh. He attended University of New Hampshire and until recently was machine tool salesman, Given Machinery Co., San Francisco.

Gordon F. Colson, since 1951 field engineer in the Chicago office, Norton Co., Worcester, Mass., has been transferred to the Huntington Park, Calif., office. A graduate of Carnegie Institute of Technology, he joined the company in 1949.

fine FANNER SUPERCHILLS

provide casting advantages available in no other chills


Top surface converges upward to a point
Cuts down and eliminates risers in many instances
No flat horizontal surface to produce "chill kicks" or "blows"
Sufficient volume to insure uniform solidification between center and outer surface
Square section can be placed in a horizontal position, so there is always a sharp surface on top
Completely eliminates all "piping" by use of proper size chill

scientifically designed to produce proper chilling at lowest cost

Fanner Superchills are superior in the pouring operation because they are scientifically designed to produce proper chilling without "blows" . . . without "kicking away" . . . without defects. The top surface has a tapered point which is enveloped gradually as molten metal rises in the pouring operation . . . allowing ample time for gases to escape before

Superchill is submerged and fused. (See cross section). The *center section* is square so that the Superchill can be placed in a horizontal position in such a way that there is no flat surface at the top but a corner at all times. Square headed tacks in the core box or on the pattern are used to indicate position. Frequently, when a round chill is used, fusion is not complete, and when drilled, the chill turns with consequent breakage. The square Superchill cannot turn . . . and its corners aid in fusion. If you do not have complete information on these exceptional Superchills, write for details today.

Qualified and specialized engineers in Fanner's Technical Service Division are available for consultation, without obligation, on problems of producing more intricate castings; developing increased strength, closer tolerances, and better quality; reducing machining and improving finish — both in ferrous and non-ferrous castings. Take advantage of the research and development work that Fanner has invested in this field to improve your profit picture. Simply direct your request to the address shown below.

Fine Fanner Superchills are made in a wide variety of sizes and shapes — uncoated or coppered. They provide better surfaces for molten metal to join with and more chilling volume per pound. They have universal use throughout industry.

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Designers and Manufacturers of Fine Fanner Chaplets and Chills

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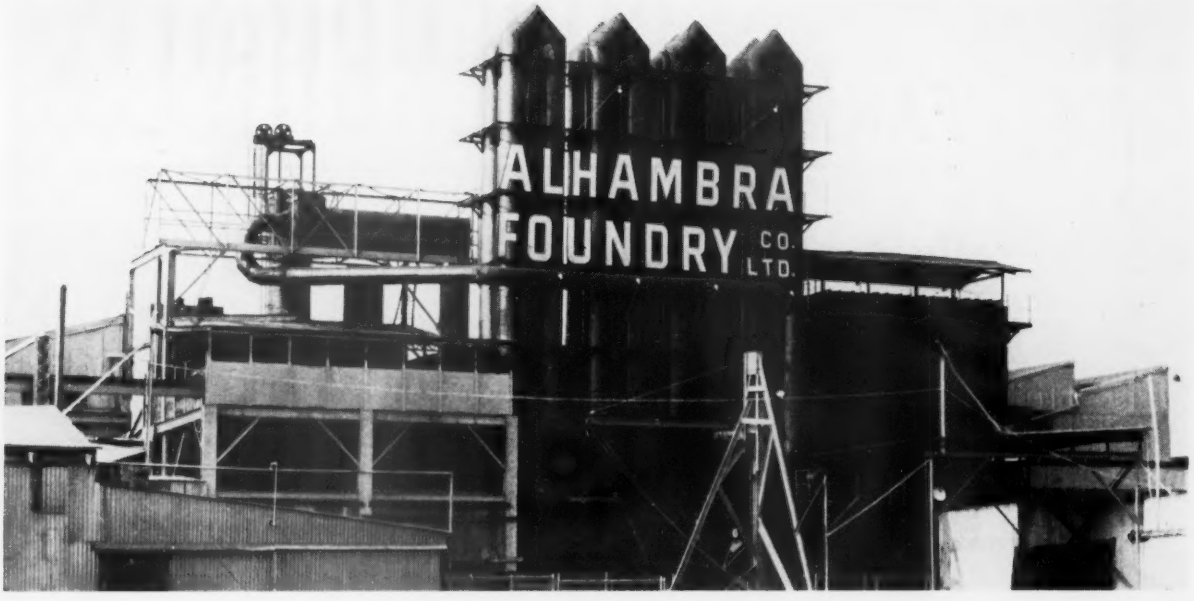


Fig. 1—General view of dry baghouse smoke collection equipment at Alhambra Foundry

Low Maintenance Cost Reported for

CUPOLA DUST COLLECTOR

By THOMAS A. DICKINSON

IN ADDITION to meeting high efficiency standards, a dry baghouse smoke control unit in use by Alhambra Foundry Co., Alhambra, Calif., is said to have unusually low maintenance cost.

The unit is classified as "dry" because it uses a series of radiant air-cooling flues for the reduction of the temperatures of cupola emissions. Flue efficiency is such that gases entering silicone-impregnated glass fabric retainers in the baghouse have been cooled from about 2000 to less than 430°F, low enough to assure long bag life.

Although it may be susceptible to certain refinements, the subject equipment is neither new nor untried from a practical or "service" viewpoint. Probably because of the alphabetical order of its name, Alhambra Foundry was among the first of 60 firms of its type to come under the scrutiny of Los Angeles county air pollution officials after the latter were organized in 1948. The company's chief engineer, Paul Siechert, decided to tackle the "smog control" problem from a different angle.

Basic smoke collection facilities used by Alhambra Foundry were procured as surplus equipment from a government-owned plant that produced antimony during World War II. Their practicality for their present application has been proved by almost five years of continuous operation.

Installation of the surplus equipment necessitated design of a ceramic-lined cap for the foundry's cupola. Provisions were made for counterbalances in this design—not only to permit the automatic release of abnormally high pressures in the cupola, but to permit manual raising and lowering of the cap before and after fire-extinguishing operations.

All this was due to a belief that steam produced in extinguishing cupola fires would cause trouble if it were allowed to enter the baghouse;

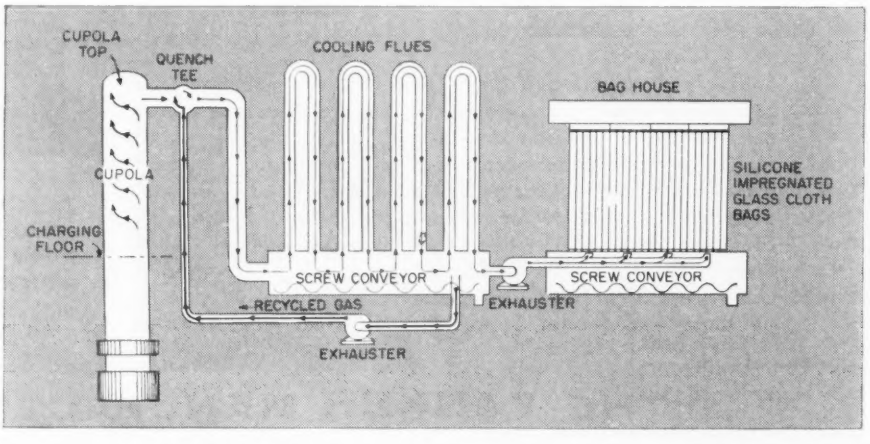
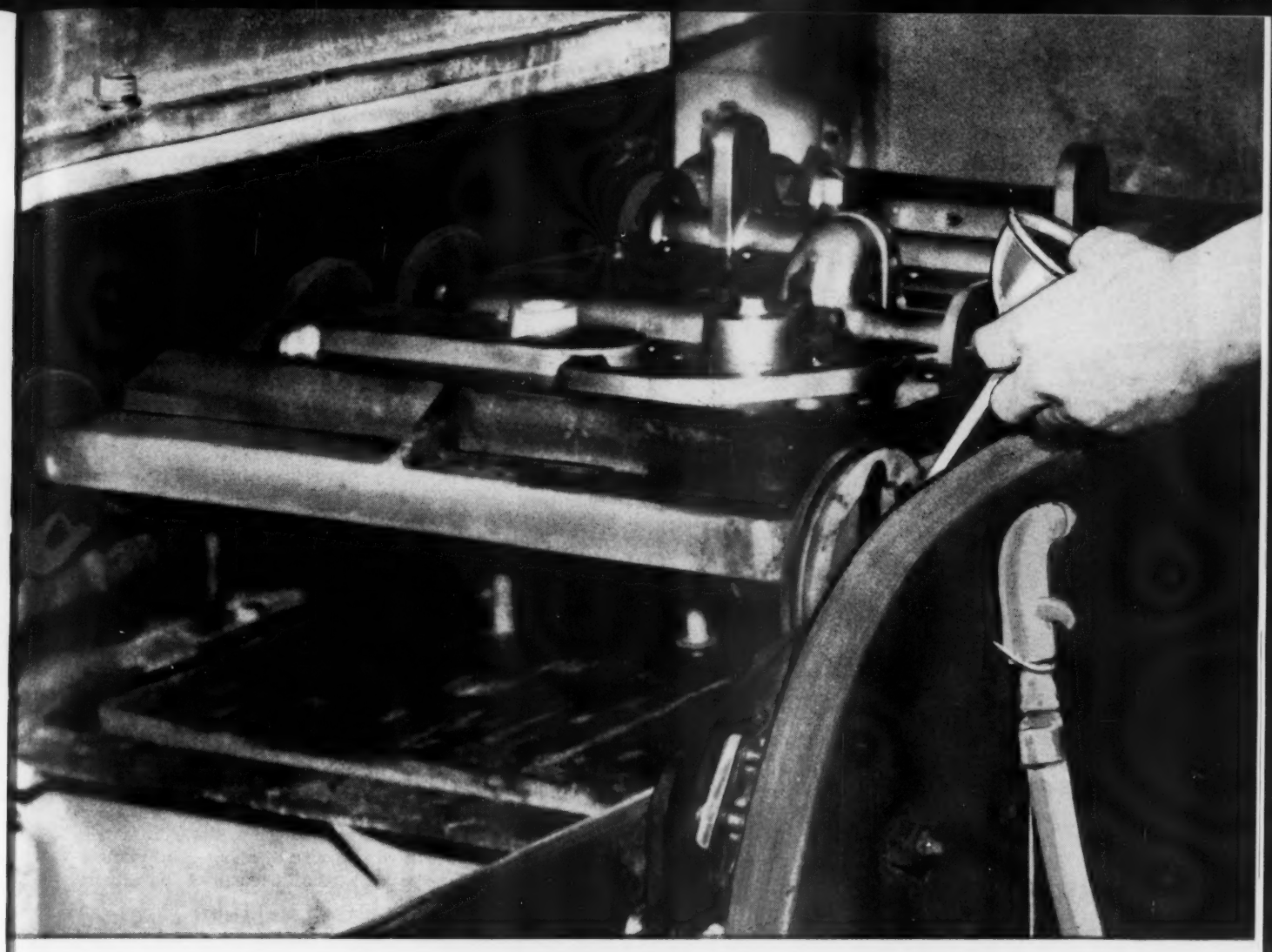


Fig. 2—Firebrick-lined outlet near the cupola top feeds smoke into a tee, and quench air is applied by a blower. Drawing shows the complete setup

Facing Page—ITEM 616→



'dag' dispersions . . . *a touch does so much!*

'Oildag' vital to continuous molding-machine operation

Production Pattern & Foundry Company of Chicopee, Mass. runs its five shell-molding machines 24 hours a day to keep up with casting-floor demand for molds. To stand up under this tough service, the machines must be properly maintained.

Maintenance personnel at Production Pattern & Foundry have found that lubrication instructions of the machine's manufacturer have paid off handsomely. Shell Process Co., which makes these shell-molding machines, recommends **'Oildag'** — colloidal graphite in petroleum oil — diluted with five parts of No. 10 oil for the lubrication of critical wear points: the axle bearings of the drive mechanism, and hitch-pivots and link pins of the roller chain. Since the roller chain is subjected to 900° F temperatures within the shell-baking oven, conventional lubricants would be useless . . . would decompose and carbonize. Proof of the effectiveness of colloidal graphite for this heavy-duty high-temperature lubrication job is the fact that the machines have operated without breakdown for more than six years!

Dispersions of colloidal graphite are extremely valuable elsewhere in the foundry too: as long-lasting lubricants for moving parts of casting machines and other foundry mechanisms; as heat-resistant ladle coatings, and effective mold coatings for better parting and controlled cooling. You can learn more about the use of **'dag'** dispersions in metal-casting operations through Acheson's Bulletin 425. Write for your free copy today.

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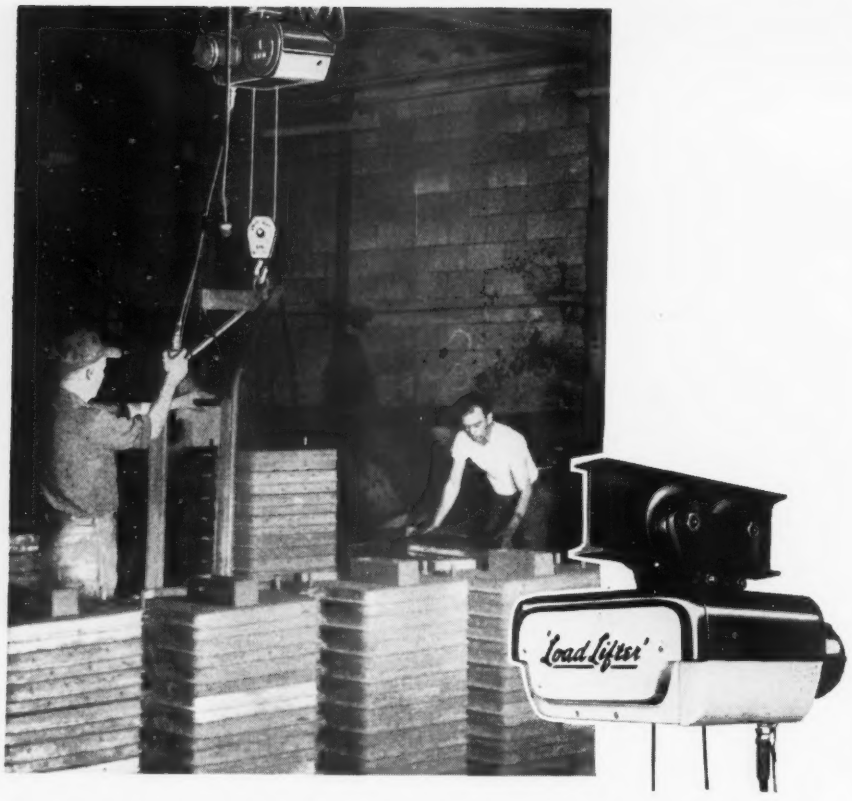

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Whether the job is to strip a flask, lift a 1-ton casting on to a shakeout or handle a tote box in a hurry, the rugged Series "600" 'Load Lifter' Electric Hoist fills the bill. Capacities: ½ and 1 ton. All types of suspension. Ask your "Shaw-Box" Distributor for details or write us for Bulletin 408.

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Circle 617 on Inquiry Card

experience has shown, however, that manual opening and closing of the cupola's top breaks hard-to-replace packing around the cap's seal and that no apparent damage is done when steam enters the baghouse. The cap, therefore, no longer is removed manually. If a replacement component of this type should be required, its design could be simplified.

A firebrick-lined outlet was situated near the cupola top to feed smoke into a tee, where quench air is applied by a blower as indicated in Fig. 2.

This reduces temperature of cupola effluent from 2150 to 1100°F and permits processing of the gases through flues made from mild steel rather than from alloy steel.

From the quench tee, gases are conducted through a balloon flue to a header which feeds two parallel lines of cooling flues. The latter are comprised of pipe 38 in. in diam, with eight U-bends. Height is 45 ft, and the two lines have a common hopper. Fig. 2 shows a general view of the equipment.

An exhaust fan draws gases through the cooling flues to a baghouse pressure chamber. Because the baghouse hopper has a positive water-gage pressure of 3 to 4 in., a negative pressure of about 2 in. is maintained at the inlet end of the exhaust fan.

Recirculates Quench Gas

Recirculated quench gas also is drawn through a separate fan from the end of the cooling flues and is returned to the quench tee at the cupola outlet. Since the inlet of the latter fan is operated at a negative pressure of 3 in., positive circulation in the quench circuit is assured.

The baghouse operates under a pressure of 3 to 4 in. and handles up to 4 cu ft of gas per square foot of bag area. The bags are 11½ ft in diam and 15 ft long and are supported at the top on movable frames which may be manually shaken to remove accumulated dust. The baghouse hopper is partitioned into four sections so that pressure can be shut off to empty part of the bags without halting smoke-abatement operations. As a rule, Alhambra Foundry does not empty the bags more than once a week.

Lifespan of the silicone-impregnated glass fabric bags is variable, depending on the sort of handling they receive and on the temperatures of gases reaching them in each instance. It is estimated, however, that their average period of usefulness is well over 24 months.

Alhambra Foundry is a 33-year-old firm employing 46 workers on a four-acre plant site which has 70,000 sq

ft under roof. Diversified yet standardized castings for construction work are its principal products.

The company's average melting rate is about 8 tons per hour, and its cupola usually melts for two hours a day. A typical charge for the cupola is comprised of 70 per cent pig iron and 30 per cent iron scrap.

Even when greasy automobile scrap has been melted, company workers have reported no trouble with tars or resins in the baghouse.

Baghouse fans start when the blast is turned on and stop after the bottom has been dropped. The plant superintendent checks the baghouse during routine inspection rounds, and no other operating labor is required.

Following the end of a given heat, about one man-hour per operational day is required to service the collection installation. This work involves emptying cooling flues as well as baghouse hoppers since all large particles in the foundry's smoke are deposited in the flues. Screw-type conveyors facilitate all emptying operations.

A typical week's accumulation of solids in the collection weighs about 550 lb. Since none is considered to be of commercial value, the entire accumulation is disposed of as trash.

Use Mineral Pitch Coatings

Some difficulties were experienced initially in keeping the cooling flues painted since coatings had to withstand operating temperatures exceeding 500°F. Relatively inexpensive mineral pitch coatings now are used, however, and the flues do not have to be finished more than twice a year. Components not exposed to temperatures higher than 400°F are said to retain a mineral pitch finish for about five years.

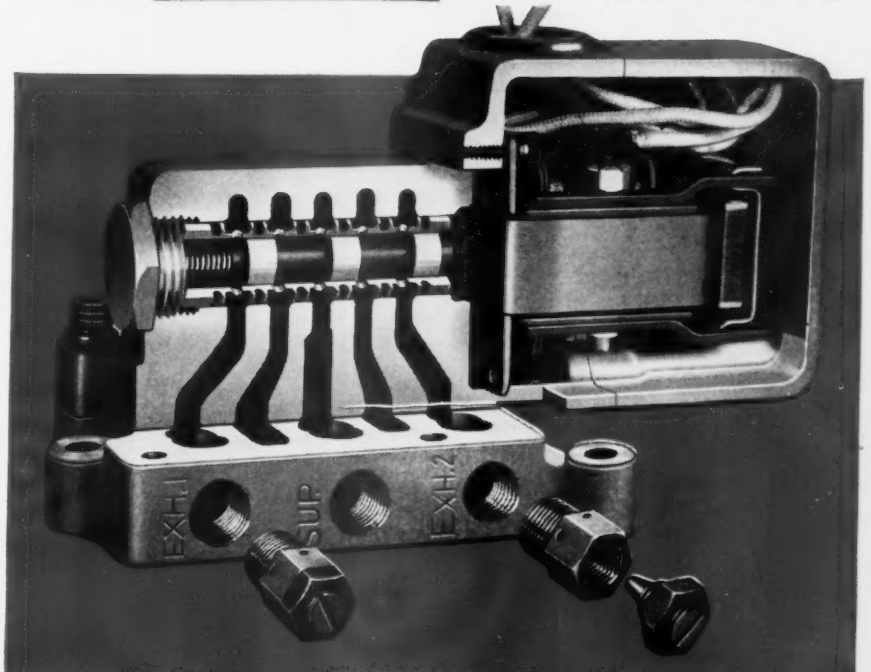
Conditions assumed in computing the cooling area required by the smoke collection equipment were as follows: Quantity of effluent from cupola, 7200 scfm; average temperature of cupola effluent, 1700°F; temperature of quench air, 350°F; temperature of gases at cooling flue inlet, 1100°F; temperature of gases at cooling flue outlet, 400°F.

Heat transfer calculations included transfer inside the flues by convection and inside radiation and outside the cooling pipes by convection and outside radiation. A summary of resultant data showed values ranging from 1.86 Btu per hour per square foot per degree Fahrenheit down to 1.18, with an average of 1.52. This gave a required cooling area of 11,920 sq ft under assumed conditions.

The direct cooling area provided for in the design amounted to 10,442 sq ft against the 11,920 sq ft required. It was assumed that the cupola cap and outlet, supporting structures,

now . . . AIR VALVES

WITH EXTREMELY FAST RESPONSE



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3. **THE RIGHT SERVICE** — ample spare parts stock, shop facilities, factory-trained mechanics and an efficient field service that keep your Hyster lift trucks going on your job, wherever your job might be located. Hyster trucks are noted the world over for their low downtime.

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FOUR FACTORIES: Portland, Oregon; Danville, Illinois; Peoria, Illinois; Nijmegen, The Netherlands.

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Pyro Lance!

for accurate measurement of heat of MOLTEN METALS

For quick, accurate temperature readings of molten metals, operators of non-ferrous foundries everywhere are relying on the Alnor Pyro Lance. Portable, handy to use, the Pyro Lance has a protected thermocouple, with adjustable angle head, mounted in the lance tip. It takes temperature below the surface—unaffected by dross or other conditions. Here's an easily handled instrument to help control quality in the foundry. For complete information and prices on this valuable instrument write for Bulletin No. 1724-D. Illinois Testing Laboratories, Inc., Room 511, 420 N. LaSalle St., Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

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catwalks, and other components adjacent to the cooling flues would dissipate enough heat through conduction and radiation to make up for a difference of about 1500 sq ft.

Tests conducted by the Los Angeles Air Pollution Control District have shown consistently that the equipment operates within limitations indicated by Table I, which indicates allowable discharge per hour.

TABLE I—Allowable Discharge Per Hour

Process Weight, Lb/Hr	Maximum Discharge, Lb/Hr
100	0.44
200	0.83
500	1.73
1,000	2.80
2,000	4.23
5,000	7.33
10,000	12.00
20,000	24.00
40,000	48.00

Issues Report on Zirconium

A new report entitled "Zirconium—Technology and Economics" has been published by the Atomic Industrial Forum Inc., 260 Madison Ave., New York 16. The 125-page report is based on proceedings of a two-day meeting held under the sponsorship of the subcommittee on Process Metallurgy and Fabrication of the group's Industrial Committee on Reactor Materials.

It includes papers and discussions on chemistry and production of metallic zirconium; its fabrication, properties, corrosion behavior and alloys; supply of raw and refined materials; commercial products available; and future Atomic Energy Commission and industrial requirements.

Price is $3 per copy.

"We're broke down. Can you make us a wheel real quick?"

"Our Edco Bottom Boards hold up at high temperatures"

. . . says Robert Garrett, General Foreman, Lebanon Steel Foundry, Lebanon, Pa.

A producer of high quality stainless, special alloy, and carbon steel castings, Lebanon Steel Foundry has been using Edco Dowmetal Bottom Boards for more than 3 years.

"In pouring steel at high temperatures ranging from 2900 to 2980 degrees F., we have found that our Edco Dowmetal Bottom Boards require replacement much less frequently than wood boards," reports General Foreman Garrett.

"Because we use thousands of bottom boards in our operation," he continues, "the fact that we can stack Edco boards in less than half the space required by wood boards is a real advantage. Our molders prefer Edco *magnesium* Bottom Boards because they are lighter and easier to handle than wood boards."

Lebanon Steel Foundry is typical of scores of foundries, of all types and sizes, that are switching to Edco Dowmetal Bottom Boards because of their performance and *permanence*.

Write for your free copy of the New Facts File. There's no obligation.

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EDCO DOWMETAL BOTTOM BOARDS
EDCO ALUMINUM CORE PLATES

Please send Facts File including list of 83 standard sizes available from stock.

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Company_____

Address_____

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Next Page—ITEM 622→

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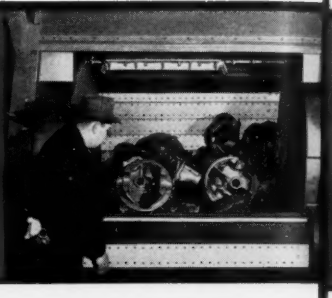
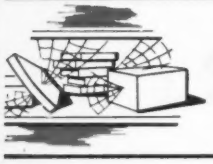
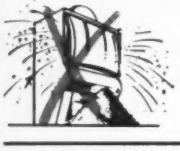
IF your performance results do not measure up to these SUPER SAVINGS it will pay you to investigate the WHEELABRATOR SUPER TUMBLAST

DAYTON MALLEABLE IRON CO.
(Ironton Div.)
Ironton, Ohio



Saves CLEANING TIME	Cleans toughest work faster than 2-wheel machine.
 **Saves WEARABLES**	Over 530 hours on one set of blades.
 **Saves ABRASIVE**	No abrasive gets out of the machine. The door stays tight.
Saves MAINTENANCE	"This machine is designed for the maintenance man", says the maintenance foreman.
Saves MAN HOURS	Automated operation relieves operator for other duties.

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WORLD'S LARGEST MANUFACTURERS OF AIRLESS BLAST CLEANING EQUIPMENT AND STEEL ABRASIVES

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A WHEELABRATOR® SUPER TUMBLAST

you operate batch-type cleaning equipment

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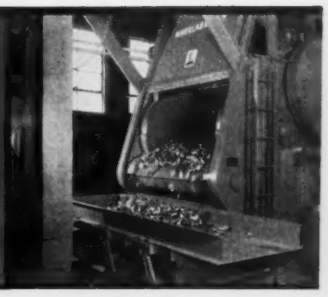

Cleans deep core work as fast or faster than 2-wheel machine.	Cleans twice the volume in half the time formerly required in smaller machines.
Over 1,000 tons cleaned and liners are just getting polished.	Not a single wearable part has been replaced in over 8 weeks of operation.
The separator removes sand and scale and keeps all abrasive in the machine.	68% reduction in abrasive costs, using Wheelabrator Steel Shot.
"Lowest maintenance blast equipment in our shop".	Maintenance negligible.
Trouble-free operation eliminates down-time.	No direct labor. Trucker operates machine.

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505 S. Byrkit Street — Mishawaka, Indiana

Speaker's table at conference dinner includes, left to right: L. J. Gallagher, J. M. Kreiner, George J. Behrendt, Carl L. Liebau, E. E. Braun, James H. Lansing, E. J. Stockum, Robert V. Osborne, T. M. Blank and Henry Pildner, speaker

MALLEABLE FOUNDERS

Hold First Technical and Operating Conference

By EDWIN BREMER
Metallurgical Editor
and
KENNETH L. MOUNTAIN
Associate Editor

WITH approximately 100 in attendance, C. L. Liebau, Federal Malleable Co., Milwaukee, president of the Malleable Founders' Society, opened the society's first Technical and Operating Conference. It was held at Wade Park Manor, Cleveland, May 24-25.

Mr. Liebau pointed out that continual changes in the foundry industry make it necessary for all to keep abreast of the times to provide quality products at an economical cost. One means to that end is a conference to provide a free and informal interchange of information on production problems and developments within the industry. Subjects discussed included pearlitic malleable iron, new molding methods, shell cores and molding, gating and feeding, and the CO_2 process.

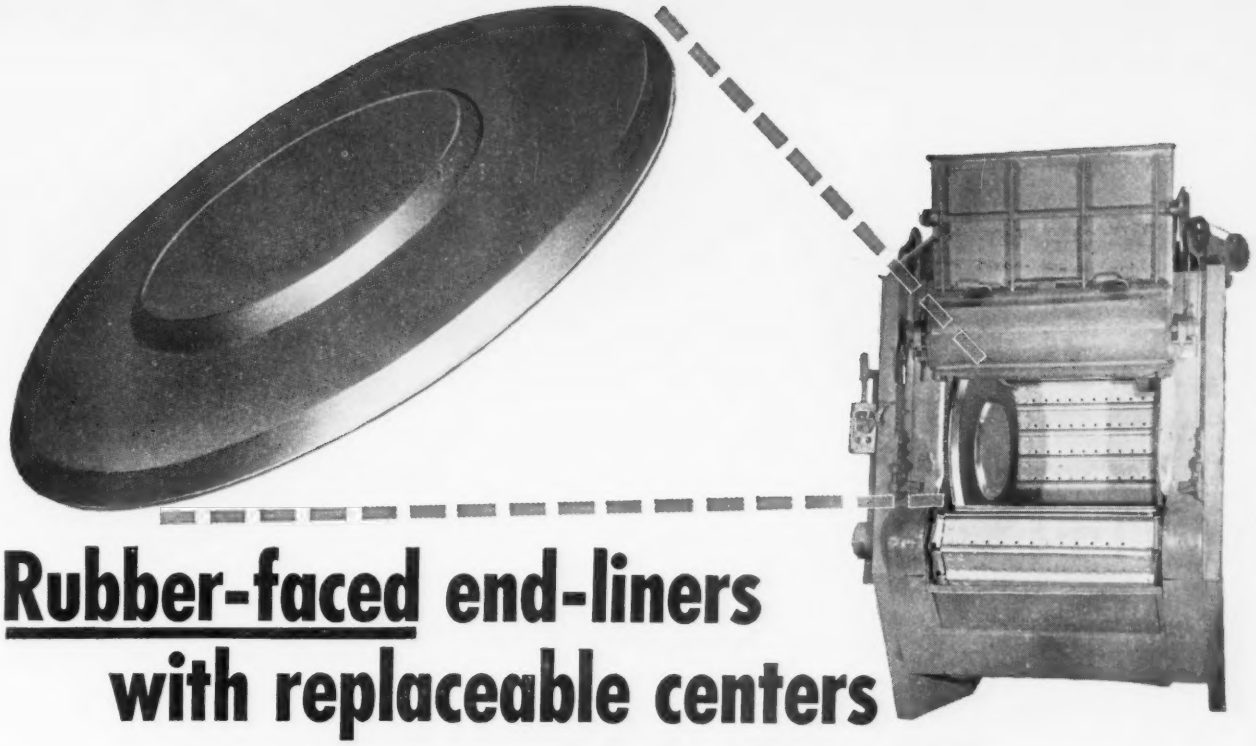
Opening session, with John A. Wagner, Wagner Malleable Iron Co., Decatur, Ill., presiding, was a symposium on the several methods of producing pearlitic malleable iron.

Alloy Pearlitic Malleable Iron—Walter M. Albrecht, Chain Belt Co., Milwaukee. Base iron for this material is the same as for regular malleable iron. The addition of ferromanganese and copper brings the final composition to 0.75 per cent Mn, 0.55 per cent Cu, 2.37 per cent TC and 0.98 per cent Si. Manganese and copper are added to definite weights of metal in the ladles, using envelopes containing weighed amounts supplied by the laboratory. Castings are heated to 1700° F for 40 hr, air quenched for 2 hr, and then reheated or drawn around 1280° F. Typical physical properties show 84,500 psi tensile, 56,500 psi yield, 8 per cent elongation and 192 Bhn.

Reheat-Treat Pearlitic Malleable Iron—George T. Boli, Northern Malleable Iron Co., St. Paul, Minn. Base material is regular malleable iron resulting from the usual periodic annealing or malleablizing cycle. Pearlitic malleable iron is obtained by heating, quenching and drawing. Three grades are produced. One type is heated to 1500° F in circular, pit-type furnaces with recirculating atmosphere, quenched in oil, drawn at 1200° F, and quenched in oil at 200° F. Typical tensile is over 73,000 psi, with an elongation of about 12 per cent. Another grade heated to 1550° F, oil quenched, drawn at 1200, and water quenched shows a tensile of over 81,000 psi and an elongation of around 8 per cent. Third type is heated to 1600° F, oil quenched, drawn at 1200° F, and water quenched. Tensile strength is over 101,000 psi, with an elongation of over 5 per cent.

Arrested Graphitization Pearlitic Malleable Iron—Lyle R. Jenkins, Wagner Malleable Iron Co. White iron of same composition as used for regular malleable iron castings is processed in continuous, radiant tube furnaces with an atmosphere consisting of 99 per cent N, 0.5 per cent CO and 0.3 per cent H at a temperature of 1650° F. (FOUNDRY, June, 1956, p. 112.) Castings are air quenched rapidly in a high-volume air stream. Air-quenched material is handled in several different ways to secure desired properties. One procedure is draw or temper in belt type continuous furnace. Another is to heat above the critical temperature in a belt-type continuous furnace, oil quench, and draw or temper to specified Bhn.

W. Truckenmiller, Albion Malleable Iron Co., Albion, Mich., discussed **Pearlitic Malleable Iron Control Procedures.** In the cupola-air furnace process, close control is maintained on the raw materials entering the cupola to produce an iron containing 2.30 to 2.40 per cent TC, 1.45 to 1.55 per cent Si, and (2 S + .10) ± 0.05 per cent Mn. Steel scrap, comprising about 42 per cent of the charges, is spot checked from time to time to eliminate inclusion of chromium-containing material which might raise the chromium content of the resulting metal above 0.04 per cent. Every half-hour determinations are made



Rubber-faced end-liners with replaceable centers

...cut shot breakage up to 50%

...greatly increase end-liner life

With Gates rubber-faced shot blast discs you make BIG savings two ways:

1. **You save on shot because the rubber disc cuts shot breakage.**
2. **You save time and cost in making end-liner replacements.**

Here's why:

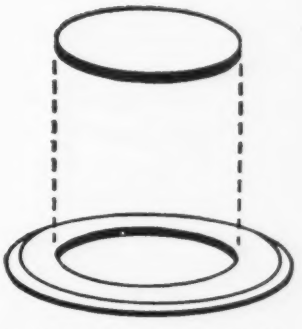
Heaviest wear on end-liners in shot blast and tumble blast machines comes in the center area. With either of Gates two types of disc (center patch, or hollow center), you replace only the center area as needed. Two or three center discs can be used before the main disc is finally worn through.

This important engineering development has increased end-liner service life up to FOUR TIMES.

And rubber protection of end-liners reduces shot breakage as much as 50% — giving you substantial savings on shot replacement costs.

For complete size and cost data, call your local Gates representative . . . or write to The Gates Rubber Co., Sales Division, Inc., Denver, Colorado.

The Mark of Gates Specialized Research



Hollow Center Disc with Patch Plate

Center disc is recessed flush in hollow center of main disc. Center can be replaced without replacing entire end-liner.

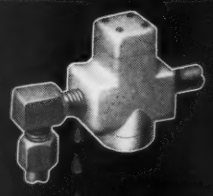
Solid Disc with Center Patch

Both discs easily bolted to main structure of shot blast machine.

Gates Rubber-Faced Shot Blast Discs

TPA 103

STOP PIPE THREAD LEAKS with



TRU-O-SEAL

TEFLON SEAL

Does away with messy pipe "dope" compounds!

PAT. PENDING

. . . Eliminates valve and pump damage caused by overtightening of leaky joints.

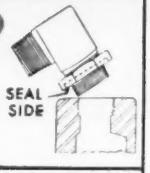
. . . "TEFLON" SEAL is immune to ALL hydraulic fluids and to steam, air, water, solvents and practically all gases and chemicals!

. . . Withstands temperatures from —100° F. to plus 500° F.!

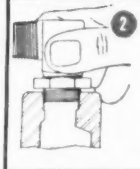
. . . *Fully field tested and proven by leading manufacturers!*

EASY INSTALLATION!

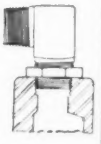
1 Thread TRU-O-SEAL on pipe or fitting (no messy pipe "dope" needed).



2 Thread pipe or fitting 4 threads into port. Point in desired direction.



3 Tighten TRU-O-SEAL to complete leakproof assembly (only light torque required).



TRU-O-SEAL stops present pipe thread leaks instantly, prevents future leaks, saves cost and labor of special or welded fittings. For 3000 psi operation (15,000 psi minimum proof pressure). Comes in ⅛" to 2½" pipe thread sizes.

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"Miller Fluid Power" is also a division of Flick-Reedy Corp.

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of C, Mn and Si content of both cupola metal and that in the air furnace. This information is posted on quality control charts; should composition tend to go beyond the range limits, proper adjustments are made.

An afternoon session on molding methods touched on automation, diaphragm molding, mold blowing and preventive maintenance. **Automation in Molding** was discussed by William G. Ferrell, Auto Specialties Co., St. Joseph, Mich., and C. H. Lambert, Eastern Malleable Iron Co., Eberhard Mfg. Division, Cleveland.

Mr. Ferrell described a unit using two jolt rollover machines in line on a flask conveyor. Machines produce copes and drags separately or in combination. Flasks are 30 x 40 in., and are indexed automatically into the machines. Finished molds are set off on an adjacent conveyor line, cored, closed and conveyed to the pouring station. Molds are made at the rate of about 17 seconds each.

Mr. Lambert said his foundry uses two similar units—single jolt-rollover molding machines in combination with an automatically indexing four-station turntable which produce copes and drags alternately (FOUNDRY, January, 1955, p. 110). Flasks are 18 x 28 in. Copes are made first and held on an upper level adjacent to the machine. Drag is made and moved from the machine onto a conveyor where the cores are set, and then the cope is lowered. Complete mold is conveyed to the pouring station. Each unit produces 300 complete molds per hour.

Diaphragm Molding was described by Paul Winters, General Electric Co., Erie Foundries, Erie, Pa., and Lon Ulsenheimer, National Malleable & Steel Castings Co., Cleveland. Mr. Winters showed a motion picture of an experimental setup developed for producing malleable iron insulator caps. It makes copes, drags and green sand cores. Molds are made in heavy-duty, magnesium-alloy snap flasks. The drag, on a movable car, is filled with sand adjacent to the diaphragm machine, then moved under the machine, and the sand compacted. Mold is moved to a rollover device.

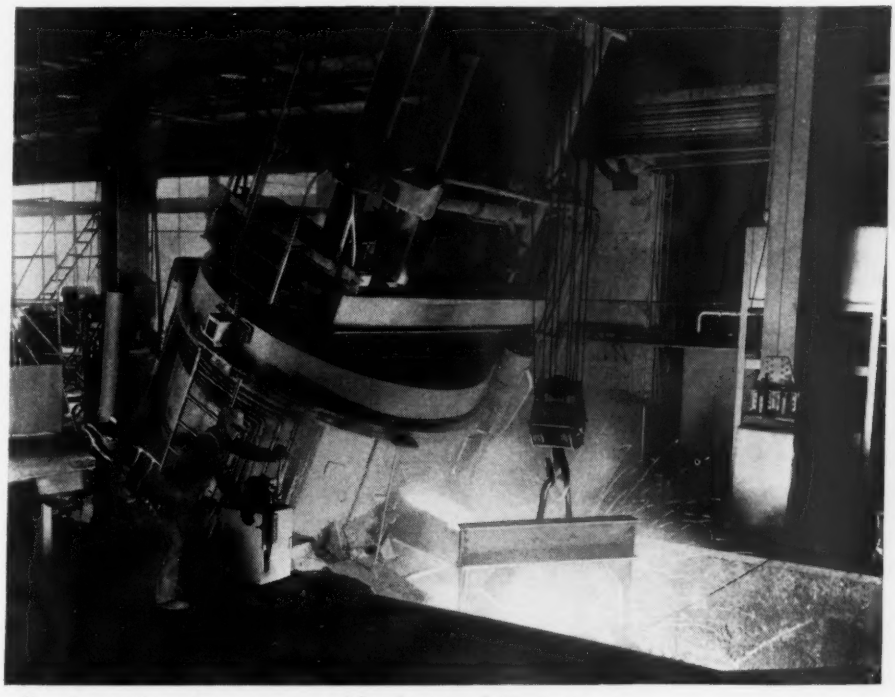
Green sand cores similarly are squeezed in a multiple cavity corebox, moved into the rollover device beneath the drag mold, the drag lowered on the corebox, and then the assembly rolled over. Corebox is lifted, leaving the cores in the drag. Cope then is squeezed, moved over to the drag and lowered in position. Snap flasks are removed, jackets placed in position, and the mold is ready for pouring.

Mr. Ulsenheimer described some results with a diaphragm machine producing molds in 16 x 25-in. tight

For 27 years,

Lectromelt* has shared in LFM's success

Looking down in the foundry bay where their two Lectromelt Furnaces offer round-the-clock operation



Pouring temperatures are exact with a Lectromelt Furnace

The LFM Division of Rockwell Manufacturing Company of Atchison, Kansas, started producing castings in 1872; added a machine shop in 1902.

SKILLS, deeply rooted in 84 years of successful operation, give LFM an enviable background against which they have adopted modern techniques and equipment—proven production tools like their two Lectromelt furnaces.

Metal made in a Lectromelt furnace is uniform and high in quality. Analyses can be adjusted with extreme accuracy. Temperatures are just right for casting, assuring that every factor is in the workman's favor.

Foundrymen interested in improving their production and reducing costs should have Catalog 9-B describing Lectromelt furnaces. For a copy, write Lectromelt Furnace Company, 314 32nd Street, Pittsburgh 30, Pennsylvania (a McGraw Electric Company Division).

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*REG. T. M. U. S. PAT. OFF

MOORE RAPID

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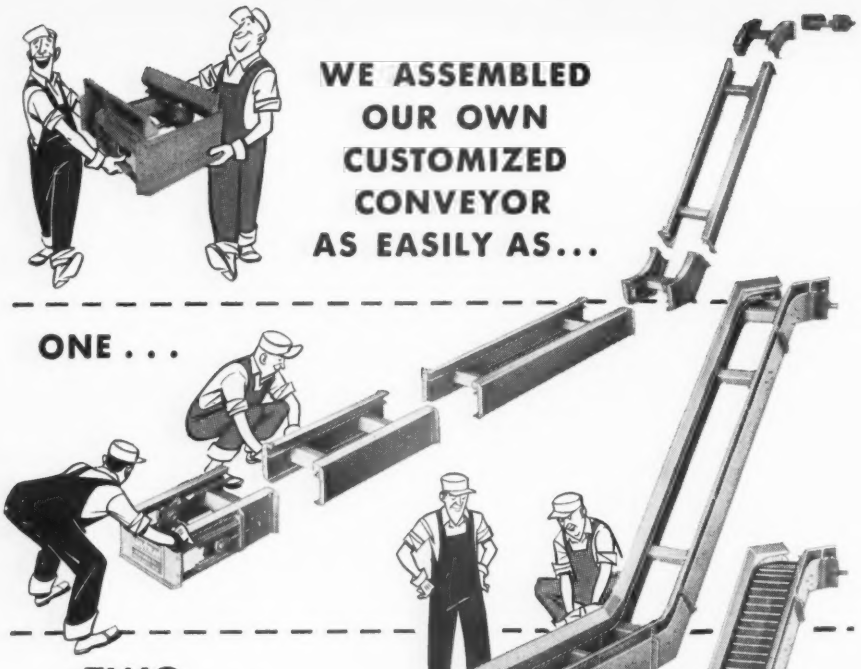

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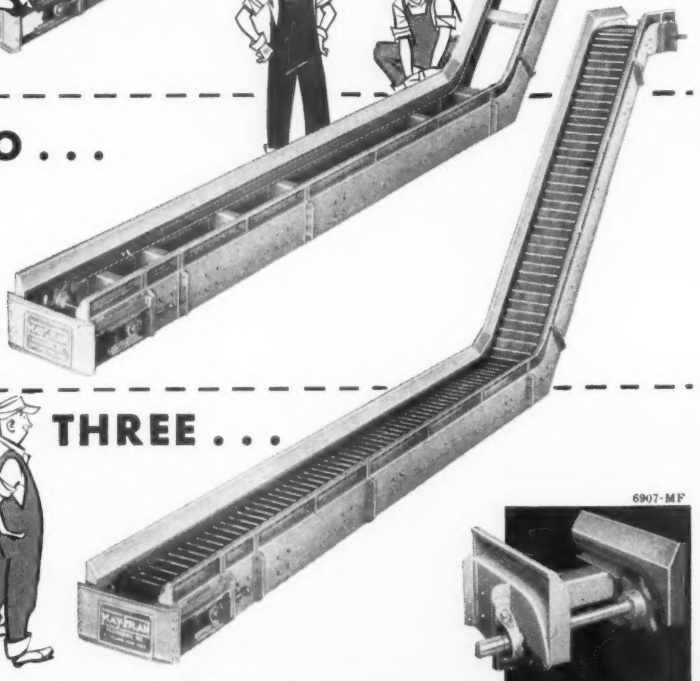

THREE . . .

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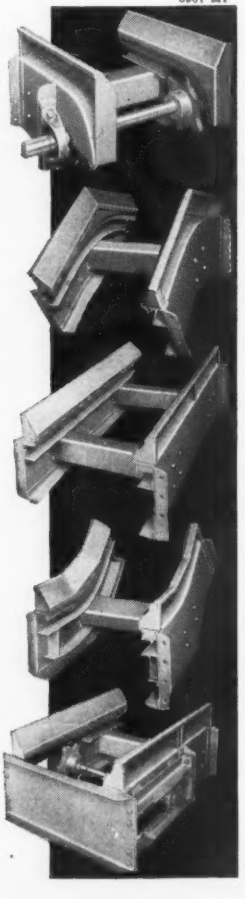

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STANDARD COMPONENTS

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flasks with a 12-in. cope. Best results were secured with a 1¼-in. upset obtained with a masking frame on the flask when filling with sand. This arrangement provides an almost flat surface on the top of the flask by striking off the excess sand. Mold hardness on vertical walls was about 70, with a variation of plus or minus 5, compared with 50 to 60 and a variation of 10 to 17 by jolt-squeezing. Flask distortion was low, measurements indicating an expansion of 0.005-in. on the squeeze, followed by a contraction of 0.003-in. on release of squeeze. Diaphragm replacement required about 15 minutes.

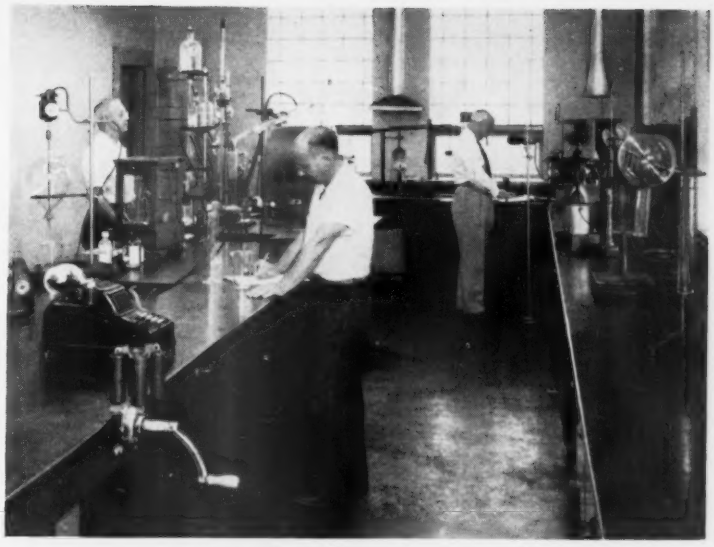
Blowing Green Sand Molds—Frank B. Rote, Albion Malleable Iron Co., Albion, Mich. A method for producing rocker arms in stack molding operation was described. Flasks are 18-in. square and 3 in. deep. Pattern plate on machine platen contains 24 half patterns, with a similar plate located on the head of the blowing machine. Flasks are perforated with ⅛-in.-diam holes for venting, but no sand blow-out is encountered. Blowplate on machine contains 38 holes. Molds are produced on a 10-second cycle.

Preventive Maintenance—Edward Wareing, Texas Foundries Inc., Lufkin, Tex. When equipment is purchased, complete data, including blueprints, should be secured from the manufacturer so that in case of trouble there will be no guesswork. Additionally, a list of recommended spare parts should be obtained, and then a supply of the parts should be stocked to eliminate long delay when a replacement part is needed.

At the same time a survey should be made to determine frequency of inspection, lubrication, etc., of the various parts. That information is copied on master cards for each piece of equipment, breaking it down into divisions where required. It is also used to provide slips relative to the inspection, etc., which are given

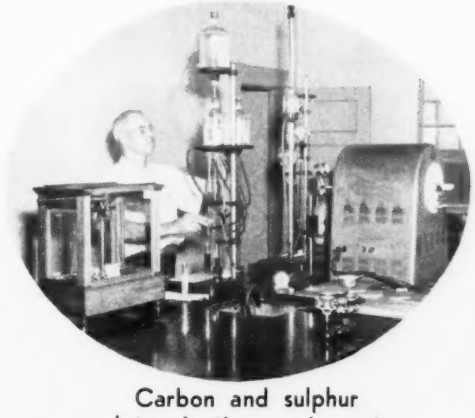
"I said chaplets!"

Close Laboratory *Controls* Consistently Maintain the High Quality and Uniformity of



A portion of ABC's modern laboratory.

ABC FOUNDRY COKE



Carbon and sulphur determination equipment.

Sinks and floats for coal washer control.

ABC maintains one of the most complete and modernly equipped laboratories of any coke producer in the nation.

In this laboratory chemists with long and specialized experience analyze all materials used in the production of ABC foundry coke to make sure they measure up to ABC high standards of uniformity and quality.

ABC coke is then tested in the laboratory by the same rigid standards.

As part of its research and laboratory testing program, ABC also operates a test cupola for checking coke performance and carbon absorption. This cupola, the only one of its kind employed by any merchant coke producer, has proved its value in forecasting coke performance and consistently maintaining the uniform quality for which ABC coke is so widely recognized.

ABC coke is available in sizes to meet the exacting requirements of any foundry operation. Your inquiries are invited.

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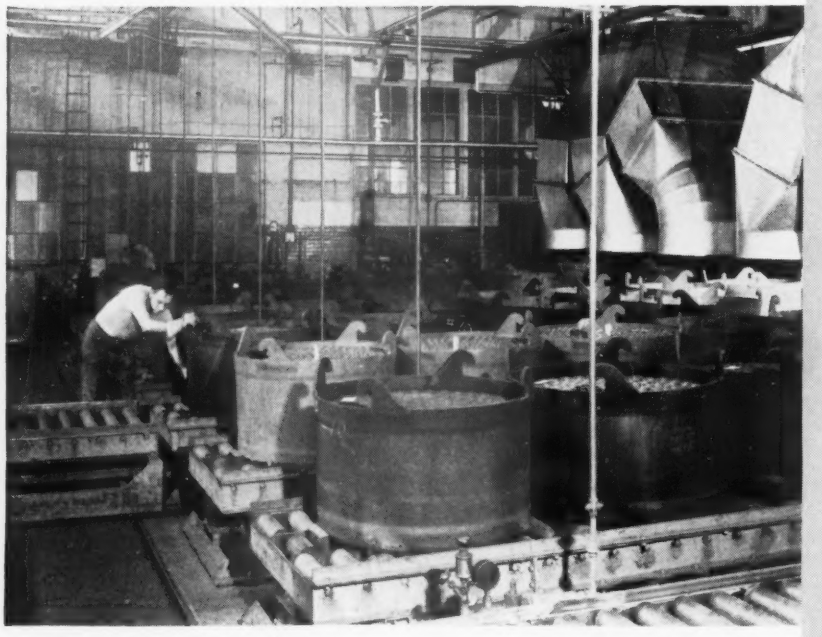
Very Few CONVEYING PROBLEMS are New to Us...



A system of spring-mounted roller conveyers, with transfer car, handling heavy pots in which pins and bushings are carborized.

Every day some manufacturer runs head-on into a conveying problem that's new to him . . . a handling job that he hasn't had to do before. It may be a package of unusual size or shape, or there may be unusual characteristics regarding space, temperature or weight.

Whatever the problem might be, chances are, we've done something like it, somewhere, sometime before.

That's where experience pays off, and you get the benefit of fifty years of it when you buy Mathews Conveyers.

50 YEARS OF MC MECHANIZED HANDLING

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Export Representative—Foreign Trade Division of New York Hanseatic Corp.

MATHEWS

Circle 628 on Inquiry Card

to the maintenance department for execution. Signed slips must be returned so that a record can be kept to indicate the operations were performed. These records provide information on wear, replacement, etc., which permits anticipation of possible breakdown and application of remedies to keep the equipment in good operating condition.

On the second day, George J. Behrendt, vice president and managing director, Naugatuck, Conn., Plant, Eastern Malleable Iron Co., moderated a panel discussion of **Shell Cores & Shell Molding.** Panel members were Hugh Pope, Eastern Malleable Iron Co., Naugatuck Plant, Carl Schopp, Ewart Plant, Link-Belt Co., Indianapolis, and Joe Orloff, foundry superintendent, Saginaw Malleable Iron Plant, Central Foundry Division, General Motors Corp., Saginaw, Mich.

Mr. Pope's shell molding operation is strictly jobbing, using two machines to make shells that are poured daily during a one-hour pouring cycle. Castings made include automotive parts, lightning arresting brackets, reamers and oil burner flame deflectors. Experience has shown that shell castings reduce machining operations, increase number of castings per mold over conventional molding methods, provide better surfaces and closer tolerances.

Pouring is done from 500-lb bull ladles through a ceramic strainer in the ladle spout. No strainers are used in the shell. Poured shells are removed from the pouring area after a 5 to 10 minute interval so that other shells can be brought up.

Mr. Schopp outlined his company's experiments with shell molding from a simple dump box, gas-fired experimental arrangement to an automatic, four-station indexing machine capable of producing 240 shells per hour (FOUNDRY, April 1955, p. 90). Mr. Schopp indicated that cooling of shell molds takes about twice as long as for green sand molding. The machine has created an interesting development in that older employees—those approaching retirement age, for instance—make skillful machine operators and can perform capably the required manual operations to complement the automatic functioning of the shell molding unit.

Central Foundry has been experimenting about five years with the shell process and considers it to be one of the industry's most revolutionary new developments. About 20,000 tons of shell castings were shipped during 1955 and the division expects to ship 60,000 tons this year. Mr. Orloff elaborated upon some of the practices used in the division in making a variety of automotive

Facing Page—ITEM 629→

WANT TO MELT A MOUNTAIN OF METAL?

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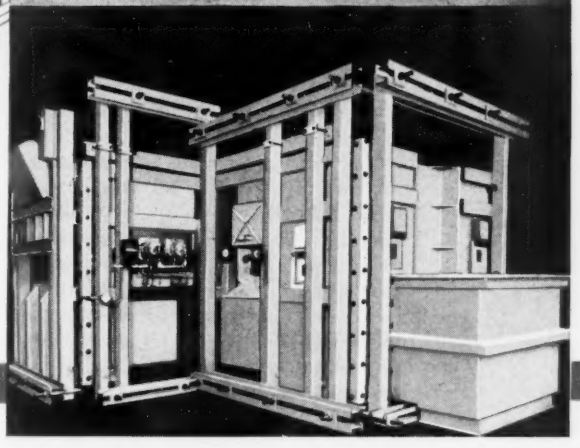
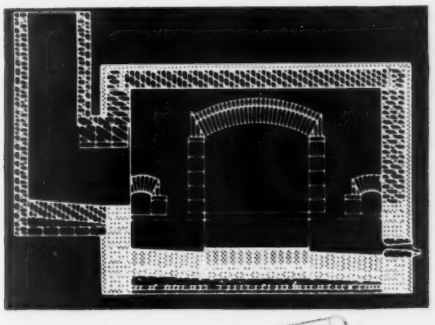
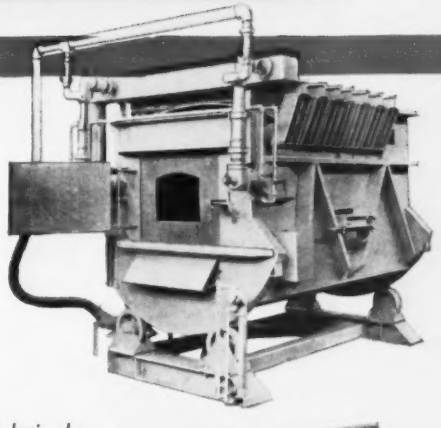
For Melting Unlimited Capacities of Aluminum, Zinc or Brass

These reverbs are built to assure heavy duty production for Smelting, Extrusion work, Die Casting, Permanent Molding and Foundry melting. Now in operation in some of the most prominent plants in the country, they have proved their ability to deliver large tonnages of metal, are easy to work with and control . . . operate most economically and are easy to maintain. Their efficiency and economy will amaze you and convince you of their superiority.

Furnaces of this type are designed to meet customers' individual requirements . . . let our engineers show you how to achieve utmost efficiency and economy in your melting operations.

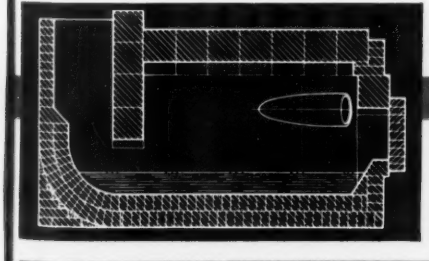




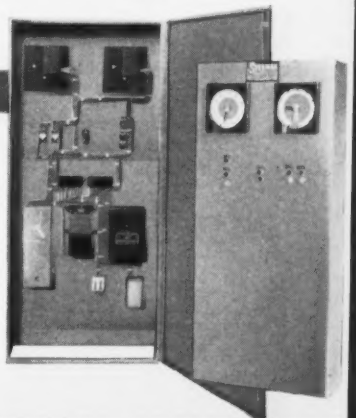


STROMAN TYPE "SW" CRADLE TILTING FURNACE FOR ALUMINUM MELTING SIZES FROM 1,000 TO 3,000 POUNDS

An ideal furnace for breakdown to supply hot metal to holding furnaces for die casting or permanent mold. Also for distribution to the molding floor in sand casting foundries. Tilted by means of an air or hydraulic ram. Furnished complete with gas or oil burners or combination burners, blower to furnish combustion air, and lining made of standard fire brick shapes.



Automatic temperature and safety controls available if desired.



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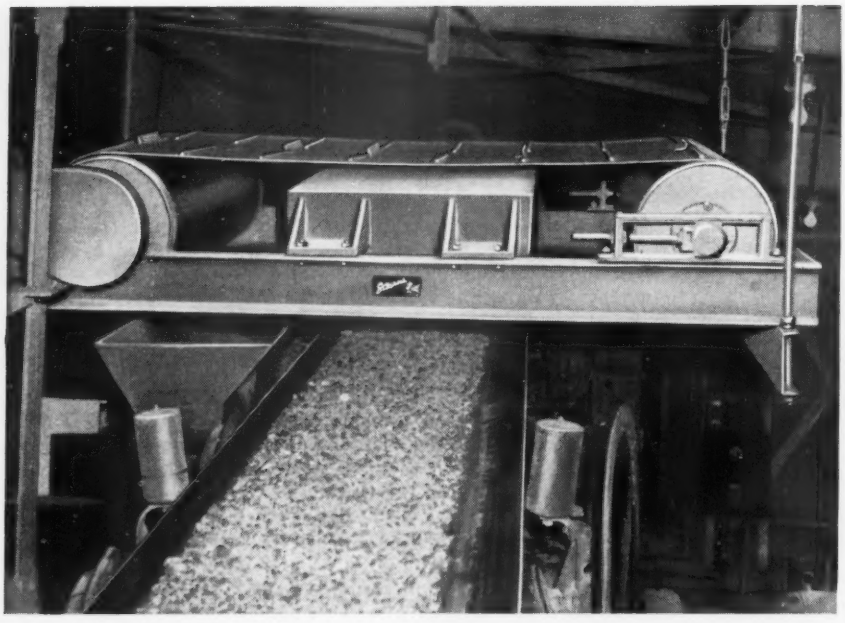
Pulls tramp iron out and whisks it away . . . automatically



Here a Stearns cross-belt separator removes tramp iron from foundry sand.

Install this new Stearns cross-belt magnetic separator over a sand conveyor line and clean out tramp iron continuously, automatically. Powerful magnet pulls out sprues, fins, gaggers, etc. which are carried away from the magnet face by a cleated, self-cleaning endless belt.

No delay

Because magnet never requires cleaning, there's no need to stop conveyor. Also, there's no danger of tramp iron ever dropping back into sand.

Guaranteed for life

The powerful, non-electric Stearns magnet is made of highest grade Alnico V steel and guaranteed permanently magnetic for the life of the installation. Its deep-reaching field penetrates material to remove embedded tramp iron.

Complete — as illustrated

The cross-belt magnet is shipped fully assembled, ready to install. Eighteen models to fit conveyor belts ranging from 20 to 48 in. wide. Custom-built models on request. Purify sand, protect equipment with this modern, fully automatic separator. Write for bulletin 88 or see your Stearns representative.

1135

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS MAGNETS

STEARNS MAGNETIC, INC., 662 S. 28th St., Milwaukee 46, Wis.

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parts, including camshafts and crankshafts, lawnmower crankshafts, flange yokes and a variety of other castings.

GMC experience indicates that shell cracking (thermal shock) can be eliminated by use of a bank sand (1 per cent clay) and incorporation of recesses into the shell at areas away from cavities so that the shell will break along the recess lines after metal has been introduced into the mold. It is essential to add the mix ingredients slowly and while the muller is in operation. Once patterns are heated it was suggested not to stop production as interruptions tend to allow patterns to cool unevenly, resulting in poor shells.

At Saginaw, patterns are heated slowly to 400° F over a 20-25 minute period. A 3 per cent solution of carnauba wax is added to boiling water and rubbed over the pattern surfaces in stages as the pattern is being brought up to temperature.

Cleans Patterns Daily

In Mr. Orloff's opinion, 90 per cent of shell mold scrap is caused by improper closing of shells and poor pouring practices. To remove caked material, patterns are cleaned daily by heating to 700° F in an oven and holding for 1½ hours. Carbonaceous material is removed following 48-64 hours' operation.

Steel or gray iron coreboxes work more satisfactorily than aluminum. Once an aluminum corebox is nicked it becomes useless. Chrome leather gloves are excellent for use in handling hot shells. Less draft is permissible in shell coreboxes than those used for green sand work; GM allows ½-degree draft in its boxes. It was suggested to always allow metal to flow into the shells of its own accord rather than to try to force it.

Reclaimed sand can be used with success, especially those portions that disintegrate completely as castings are shaken out. Hot tear tendencies are present when varying thicknesses are in the casting design. Similar castings made in green sand don't have such hot tear tendencies so caution must be exercised. Tolerances and dimensional accuracy depend upon malleable expansion, annealing, hard or soft metal and accuracy of pattern equipment. Dermatitis cases have developed in some shell mold operations but it appears to be an individual susceptibility situation. Employee cleanliness, proper ventilation and exhaust systems were suggested as means to minimize possible infection.

Objectives Ahead was the subject of James H. Smith, general manager, Central Foundry Division, General Motors Corp., at a luncheon talk. Mr. Smith discussed some of the areas

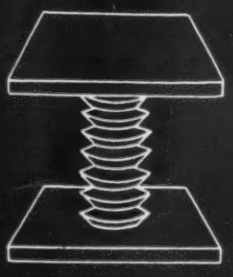
in product development, process improvement and customer service that are an important part of a company's total engineering service in developing a better designed casting, simply produced at minimum cost. Engineering knowhow must adopt new methods, new machines and ever-changing techniques to keep abreast of progress and maintain castings production at its proper level within the industrial scheme. A sound-color film, "To Meet the Challenge," was shown.

James H. Lansing, technical and research director, Malleable Founders' Society, summarized the work of the society's Gating and Feeding Committee with a simplified interpretation of the practical aspects of the continuing research. Emphasis of the gating and feeding research has been directed toward ways to increase yield through improvement in feeder design. It was pointed out there are advantages to having feeders located on sides of castings rather than on ends; that the most efficient riser type has a height but slightly greater than its diameter; that round or square gates are most effective; that, as a general observation, variations in pouring temperatures in the range of 2600-2750° F will not affect shrinkage; that there is no appreciable difference between tapered and straight-sided feeders; that chills have greatest effect when placed between feeders rather than on ends of castings and the use of solidification curves previously established is still important in estimating feeding distances.

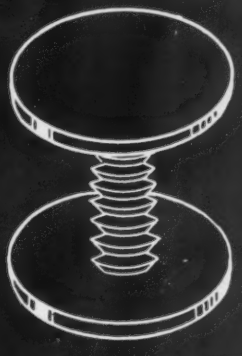
Ernest Stockham, Dayton Malleable Iron Co., moderated a discussion on **Applications of the CO_2 Process.** B. C. Yearley, National Malleable & Steel Castings Co., Cleveland, discussed his company's experiences on developmental work with the process and Hans Jacob, foundry superintendent, Lehigh Inc., Easton, Pa., elaborated upon the coremaking production techniques used in his foundry.

Mr. Yearley traced the laboratory work begun about two years ago. From these experiments they have learned that CO_2 sands do not pack as closely as other materials, permitting a degree of movement and theoretically, at least, providing a chance to eliminate hot tears. Sand used must be dry and not hot. CO_2 cores will not be as hard as oil sand cores. It appears that ease of shakeout of CO_2 cores will not quite approach that with oil sand cores. Shakeout qualities of CO_2 cores can be improved with additions of varying amounts of organic materials as pitch, wood flour or seacoal, but use of these materials tends to defeat an attempt to eliminate all gas in the mold. In theory, 1 per cent of the

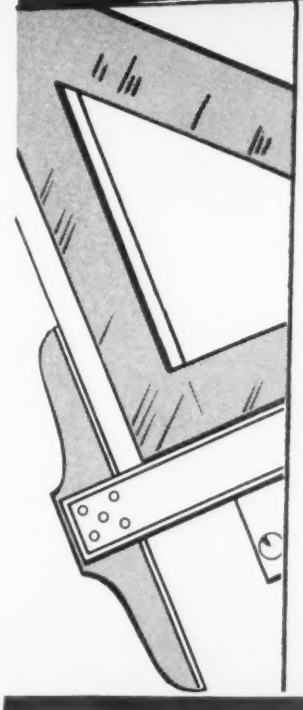
MILWAUKEE DOUBLE HEAD CHAPLETS



STEM DIA. 1/8" to 1 1/4"

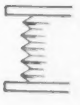


DESIGNED IN A VARIETY OF HEAD SIZES AND GUAGES TO MEET ALL CORE AND MOLD CONDITIONS

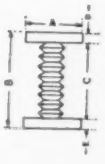


Sharp Threads - Metal Starts Knitting at Edges

Many Threads to Knit and Fuse



Threads from Head to Head - Chaplet Fuses Evenly



Tolerance Variation Held to Strict Minimum

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weight of core in CO_2 is required for curing.

Mr. Jacob discussed the techniques used at his foundry in producing CO_2 cores. About 75 per cent of the cores used at Lehigh are made with CO_2.

The cores range in size from a few ounces to 78 lb. Material costs have been reduced from conventional coremaking procedures and employees are said to like working with the method.

The sand employed is a washed and dried silica of 75 AFS fineness with a moisture content below ½ of 1 per cent. Curing time for a 5-lb core is about 6 seconds. No corebox release agents are used. Shakeout has been improved by keeping additives at an absolute minimum, reducing sodium silicate percentages and minimizing mulling and gassing times.

Pouring ladles have been lined with a zircon-silica sand mix, 6 per cent sodium silicate binder. Linings compounded in this manner reportedly outlast several conventional linings.

O. K. Hunsaker, technical director, Ironton Malleable Division, Dayton Malleable Iron Co., Ironton, O., closed the conference with a discussion of **The Use of Quality Control to Reduce Scrap.** The speaker outlined the quality control program in effect at his company that begins with purchase of scrap to meet rigid specifications, controlled melting practices, rigid sand control and continual checking of patterns for accuracy. Radiographic and x-ray inspection are used to complement in-process inspection. Service representatives call on customers in a continuing effort to improve relations with them and be on the alert to provide the customer with improved, better designed castings. For a quality control program to be of any value, the data collected must be followed up and acted upon.

Name Four Winners of Trinks Industrial Heating Award

Two executives and two engineers who have made important contributions to the science of industrial heating on May 28 received the Trinks Industrial Heating Award, highest honor in the industry.

Honored were John W. Harsch, director of engineering, Leeds & Northrup Co., Philadelphia; William C. Dunn, chairman of the board, Ohio Crankshaft Co., Cleveland; Osgood J. Whittemore Jr., research ceramic engineer, Norton Co., Worcester, Mass.; and Ernest G. de Coriolis, director of research and development, Surface Combustion Corp., Toledo, O.

The award is named after Willibaid Trinks, professor emeritus, Carnegie Institute of Technology, and is bestowed annually. Prof. Trinks, who is a member of the panel of judges, was first recipient of the award and is a world authority on industrial heating problems.

Other judges are Dr. John C. Warner, president, Carnegie Tech; T. J. Ess, managing director, Association of Iron & Steel Engineers, and editor, *The Iron and Steel Engineer;* Carl L. Ipsen, executive vice president, Industrial Heating Equipment Association; and Glen C. Riegel, Aiken, S. C., retired chief metallurgist, Caterpillar Tractor Co., Peoria, Ill.

Forms Subsidiary Company

S. Obermayer Co., Chicago, has formed a wholly owned subsidiary, Esso-Ramtite Co., to manufacture materials for the parent company's two operating divisions, Obermayer and Ramtite. Esso-Ramtite has acquired property on the Chesapeake & Ohio Railroad in Kentucky, across the Ohio River from Portsmouth, and will start construction of a plant there immediately.

Present arrangements for refractory production for Obermayer Division at Oak Hill will be continued and the refractory production equipment now in the Chicago and Cincinnati plants will be transferred to the Kentucky plant. Additional equipment will be installed so that the company will have two integrated plants for refractory production. Installation of equipment for the manufacture of foundry facings for Ramtite Division will follow completion of the refractory plant.

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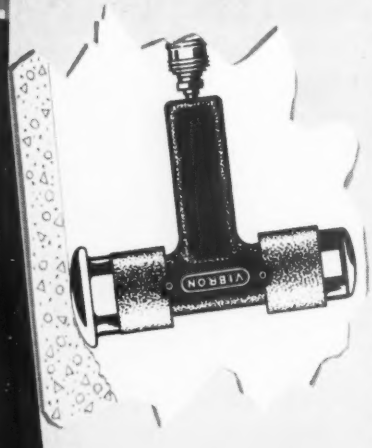
VIBRON BANTAM RAMMER IS . . .



The Smallest pneumatic rammer available with a POWERFUL SHORT HI-FREQUENCY STROKE
Versatile — Works in ladles as small as 8 inches.
Durable — Used successfully and continuously for 3 years — the 1st are still in daily use.

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Now relatively dry refractory can be formed into dense monolithic linings. Also insures complete interlocking of new refractory with old. No voids, cracks, fissures or lamination in built up layers — ever!

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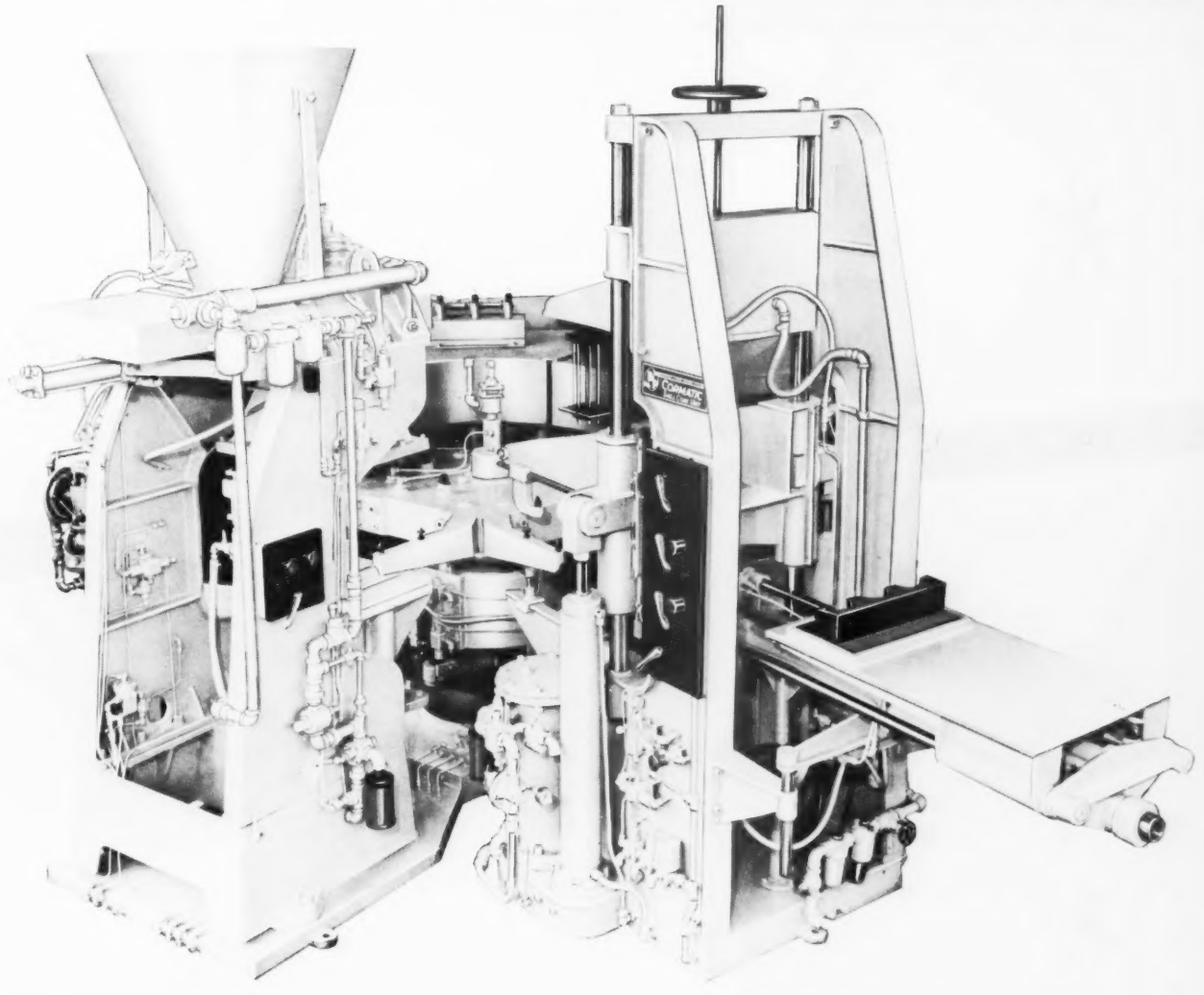
"I don't think he will ever get used to this heat."

Facing Page—ITEM 633→

NOW!

The First Complete Shell

Core Blowing Production Unit



THE NEW CORMATIC SHELL CORE UNIT

Now the new Cormatic provides foundrymen with the first complete shell core blowing production unit. It's the most advanced unit of its type with full provision for complete automatic control of all phases of shell core making. Yet it incorporates foundry-proved practicability and simplicity with all-pneumatic operation and ruggedest construction. There are no electrical relays or circuits.

Production is up to 300 complete cycles per hour. With multiple core box equipment, 600, 900, 1200 or more shell cores can be produced each hour. Check the features of this new unit and then write for full information to *Beardsley & Piper, Division Pettibone Mulliken Corporation, 2424 North Cicero Avenue, Chicago 39, Illinois.*

It's all pneumatic, no electrical relays or circuits

Handles five core boxes in a high production cycle

Complete automatic control for every operation in the cycle

Top production with no chance of error

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BEARDSLEY & PIPER
IN SHELL PROCESSING MACHINERY

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CHICAGO HARDWARE LEADS THE WAY!

with the shell machine that stole the show at Atlantic City!

A jobbing foundry installation of a **FORMATIC** production shell molding unit

Flexibility is the best word for the new Formatic shell molding units, for they are equally at home in production or jobbing foundries. These advanced units handle three different patterns simultaneously at production rates of up to 120 complete full size 24"x 30" shells per hour. If the pattern size is divided, 240 shells may be produced hourly; and if each pattern is divided into four 12"x 15" patterns, up to 480 shells are produced hourly.

Production foundries and jobbing foundries alike find that the Formatic is the best buy in the shell molding field. Check the exclusive features and then send for full information: *Beardsley & Piper, Division Pettibone Mulliken Corporation, 2424 North Cicero Avenue, Chicago 39, Illinois.*

FLEXIBILITY – Independent pattern mounting—pattern and heater plate are mounted as a unit, permitting quick, easy pattern changes.

VERSATILITY – Handles three different patterns simultaneously with individual controls for each pattern.

CONTROL – Pattern temperature, pattern investment and furnace cure are controlled individually for each pattern.

PRODUCTIVITY – Up to 120 24"x30" or 480 12"x 15" shells per hour.

UNIFORMITY – Exclusive Formatic investment station design – the most uniform shells produced on any unit.

COMPACTNESS – No unit with anywhere near the production installed in so small an area.

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Society of Tool Engineers Surveys Future of Automation

A 12-page brochure on the effects and future of automation now is available to top management executives. Entitled "Automation—What's Ahead?" the booklet summarizes results of a recent survey by the American Society of Tool Engineers. It covers many industries and includes plants of all sizes in all regions of the United States.

The survey indicates that as far as industry can see today, automation eventually can be applied to about 16 per cent of all manufacturing operations in metalworking industries. The automotive industry still is the largest market for automated equipment. More than one-fourth of its 1956 equipment purchases will be automated and more than one-third of its combined 1956-57 purchases.

The foundry industry is named as potentially one of the most highly automatable. As much as 70 per cent of foundry operations are seen to be automation possibilities.

A complimentary copy of the booklet will be sent to the executive officer of a company when requested on company letterhead. Additional copies are available at $5 each. Write to Automation Survey, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 38.

Texas Firm Plans To Produce Bentonite for Foundry Use

The Industrial Department of Magnet Cove Barium Corp., Houston, Tex., has begun a long-range diversification program to develop new markets for its products, at present used primarily in the oil well drilling industry. The program is aimed at finding new applications for present products and at locating and mining various other minerals used by American industry.

Bentonite, for example, has been produced by Magcobar at its Greybull, Wyo., mine and mill for use as a drilling mud. Under the new program, the company also will exploit its use as a bonding agent for foundry sand molds. Recent developments of the program include the discovery of a new deposit of calcium base bentonite, a material used by foundries, in Mississippi.

As part of its move for diversification, the department has expanded its staff with four appointments, including the naming of Arthur Zrimsek as foundry sand engineer.

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Since 1939, when the introduction of Malleabrasive revolutionized blast-cleaning, there has been only one MALLEABRASIVE!

MALLEABRASIVE was developed through exhaustive research. Its leadership has been maintained through continuing research and improvement.

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- MALLEABRASIVE has no exact counterpart—there is no other product exactly like it.
- MALLEABRASIVE is patented because of its own distinctive metallurgical characteristics.
- MALLEABRASIVE is produced only by manufacture under the full and complete MALLEABRASIVE process—used by Globe exclusively.

The qualities that make Malleabrasive distinctively different have made it the most widely used premium abrasive in the world today. In hundreds of plants it has made important reductions in blast-cleaning costs. Undoubtedly it can do the same in yours. At least, why not investigate its possibilities? Write us.

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Fig. 1—Over-all layout of experimental foundry area, General Motors Research Staff

EXPERIMENTAL FOUNDRY

Develops New Materials

An important feature of the new General Motors Technical Center is an experimental foundry operated by the Metallurgical Engineering Department of the research staff to develop new materials for GM

Fig. 2—One technician weighs microchemical alloying additions as other determines carbon of a steel heat

Fig. 3—Mass spectrometer is used to monitor melting of new alloys in the vacuum induction melting furnace

Fig. 4—View shows layout of the experimental foundry area, including the jobbing floor in the foreground. Melting equipment is visible in the background

AN experimental foundry with unusual facilities for investigation of alloys and molding methods is an important feature of the new 330-acre General Motors Technical Center near Warren, Mich., 20 miles from Detroit. Operated by the Metallurgical Engineering Department of the General Motors Research Staff, it is located in the Metallurgical Research Building. Fig. 1 shows the layout.

Primary purpose of the foundry is the development of new materials to benefit the great variety of products made by GM. This job requires work with metals of little-known properties as well as with the common alloys. Although study of such foundry processes as mass handling and transfer systems is not part of the foundry's mission, it does not hesitate to undertake complete development of manufacturing procedures for processing of new material on a production basis.

A good example of such work is the high-temperature alloy GMR-235, developed for jet engine turbine buckets. GMR-235 is a nickel-base material which has a low strategic alloy content, but provides excellent hot strength for cast jet parts. It currently is used in Allison military turbojet and turboprop engines.

Precision investment techniques required for this cast alloy were not well known in the early part of the program. The research staff consequently pioneered a workable casting procedure which led to the establishment of an investment foundry within the corporation. As the requirements for the alloy expanded, research personnel worked closely with the manufacturing divisions to insure proper transference of special processing techniques for a high-quality product;

Fig. 5—Transparent molds like this permit study of metal flow during casting

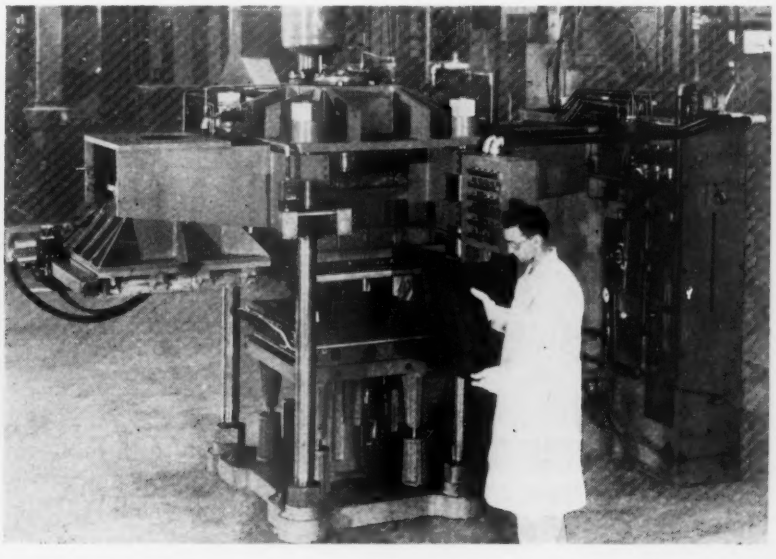


Fig. 6—Automatic shell molding machine is production prototype of unit developed by the research staff and now in use

investigation of advanced superalloys for application at higher and higher temperatures is a continuing program in the Metallurgical Engineering Department.

Facilities of the experimental foundry include melting equipment ranging from 5-lb induction melting furnaces to a 1500-lb capacity direct arc furnace. Vacuum equipment includes a 50-lb induction unit for melting and casting to shape in atmosphere or vacuum and a direct arc, cold crucible vacuum unit, now being installed, which will produce 3-in. diam ingots. An additional vacuum furnace will become available soon in the Isotope Research Building, where radioactive materials can be prepared under rigid control for use in tracer study techniques.

A mass spectrometer, shown in Fig. 3, has proved to be a valuable tool for monitoring the vacuum melting cycle. Almost immediate analysis of outgassing from melts has aided the study of metal reactions. This ability is especially useful for new alloy development.

An experimental jobbing foundry, Fig. 4, affords a source of quality castings to advanced engineering groups both at the Technical Center and in the divisions with no risk of exposing confidential designs. For example, essential cast components for the corporation's vehicular gas turbine and free-piston engines were made in this foundry.

Familiarity with melting of all metals and with techniques for gating and risering them is required to assure best possible service to the engineering groups. These include light metal alloys, copper-base materials, the many varieties of cast iron, engineering steels, stainless steels, higher-temperature alloys and the more exotic metals required for advanced engines.

An intensive shell molding program has been maintained since 1947, when the process first was investigated as a precision casting method for alloys developed by the research staff. Further evaluation of the process as a promising molding method for GM foundries has been justified by the current production volume of shell-cast parts in more than a half-dozen plants. The research staff has cooperated with personnel in those plants on improved shell mixes, useful mold release agents, pattern design and other problems.

Develops Shell Mold Blower

A recent significant contribution has been automatic shell molding machines which employ the concept of blowing the shell mix on the pattern to the proper thickness and immediately curing it with a heated, contoured press-head. Three of these "Blow-Hot Press" machines have produced shell molds for camshafts at the rate of 600 castings per hour in the Defiance, O., plant of Central Foundry Division. Invented and built by the research staff, this equipment was developed for production use in co-operation with Central Foundry Division. Fig. 6 shows a prototype model on the floor of the experimental foundry. (FOUNDRY will publish a complete description of camshaft production on this unit at Danville in an early issue.)

The cast metals group maintains a control center, shown in Fig. 2, and performs radiography with 250,000-volt x-ray equipment. Conventional equipment for mechanical testing is located conveniently in the work area. Access to heat treating furnaces using H_2, N_2 or CO/CO_2 atmospheres is provided.

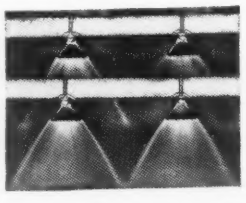
A 700-ton forging press and a small rolling mill permit reduction of cast ingots to bar stock and sheet,

Foundry Sands Reclaimed at Low Cost

The Leahy® Vibrating Screen with FlexElex heating of the jacket has opened a new horizon of economy for foundrymen. Damp foundry sands, formerly bothersome to screen, are now reclaimed accurately and economically with this versatile equipment. Operating in the fine mesh range, it is quickly adapted to the screening of different sizes by a simple change of jacket—a matter of but a few moments. For a new approach to sand reclamation, send for Bulletin 16-EH.

CONCENCO® Spray Nozzles

These inexpensive nozzles are flexible and easy to install. Ideal for employment as air nozzles with moulding equipment. Easily installed or replaced. Quickly and definitely aligned for most effective results. Also efficient in washing, sluicing or spraying operations.



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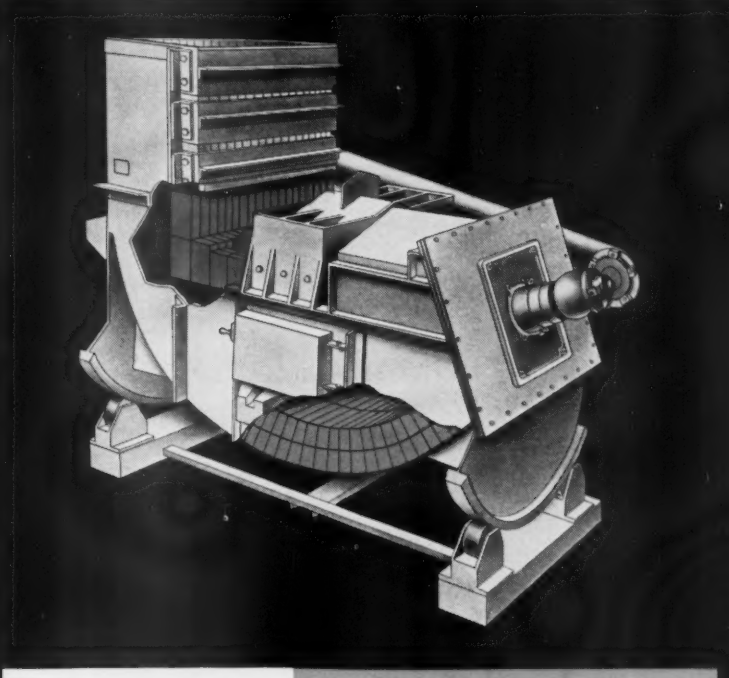
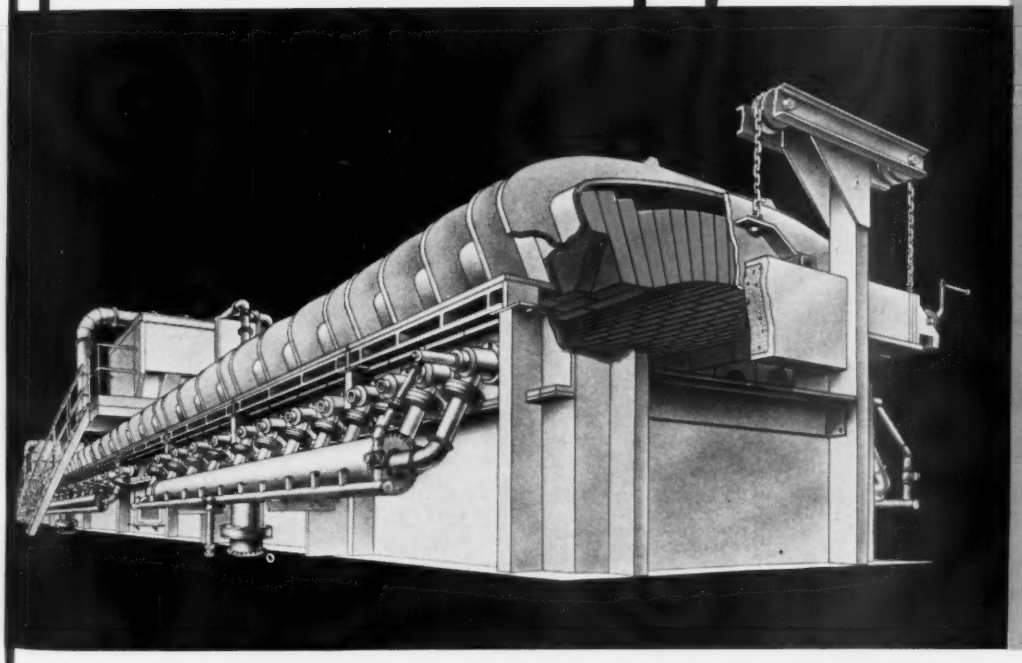
Why B&W Allmul Firebrick withstand punishing service in furnaces like these



▲ Direct-fired reverberatory furnace for melting brass, aluminum, and iron. For longer refractory life, B&W Allmul Firebrick are used to line the bath and arch.



◀ In this type of furnace for continuous high speed heating of strip for welding into pipe, temperatures in excess of 3000 F are common and the atmosphere is contaminated with iron oxide. Because of their resistance to spalling and metal penetration, B&W Allmul Firebrick have set new standards for refractory life in bungs, burner blocks and recuperators.

B&W Allmul Firebrick stand up under extremely high temperatures at continued high rates of operation because they are produced from electrically melted mullite grain by a highly efficient process. These top-quality brick have high hot-load strength, high resistance to spalling, good volume stability and a melting point of 3335 F.

They are practical from a cost standpoint for a wide range of applications in the ferrous and non-ferrous metal industries. Illustrated on this page are a butt-weld furnace as well as a direct-fired reverberatory furnace. Other services are direct and indirect-arc electric furnaces, air furnaces, furnace hearths subject to iron oxide scale attack, crucible melting units and furnaces melting many non-ferrous metals and alloys.

Your B&W representative can show you how B&W Allmul can lower your refractory costs in many heavy-duty services. Consult him or write for Bulletin R-34A, giving data on B&W Firebrick for exacting services.

B&W REFRACTORIES PRODUCTS: B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars • B&W Silicon Carbide

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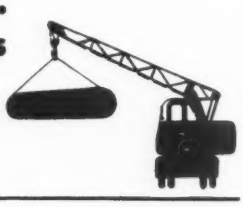

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without cooling to room temperature if desired. X-ray diffraction and electron miscroscope facilities are available in the nearby Physics and Instrumentation Department for more basic studies.

Most of the developments of the research staff must be considered confidential, but a few accomplishments in addition to GMR-235 and the Blow-Hot Press shell molding equipment have been made public. They include the following:

1. The use of minute amounts of tellurium or bismuth in malleable iron to reduce the long annealing cycle.

2. A method of making microchemical additions to permit casting of larger than conventional sizes of malleable iron. This was adopted by Central Foundry Division for production of Pontiac crankshafts in Armasteel (GM's tradename for pearlitic malleable) at the Danville, Ill., plant.

3. A fundamental study of fluid dynamics by use of plastic molds has provided more scientifically designed gating system (Fig. 5).

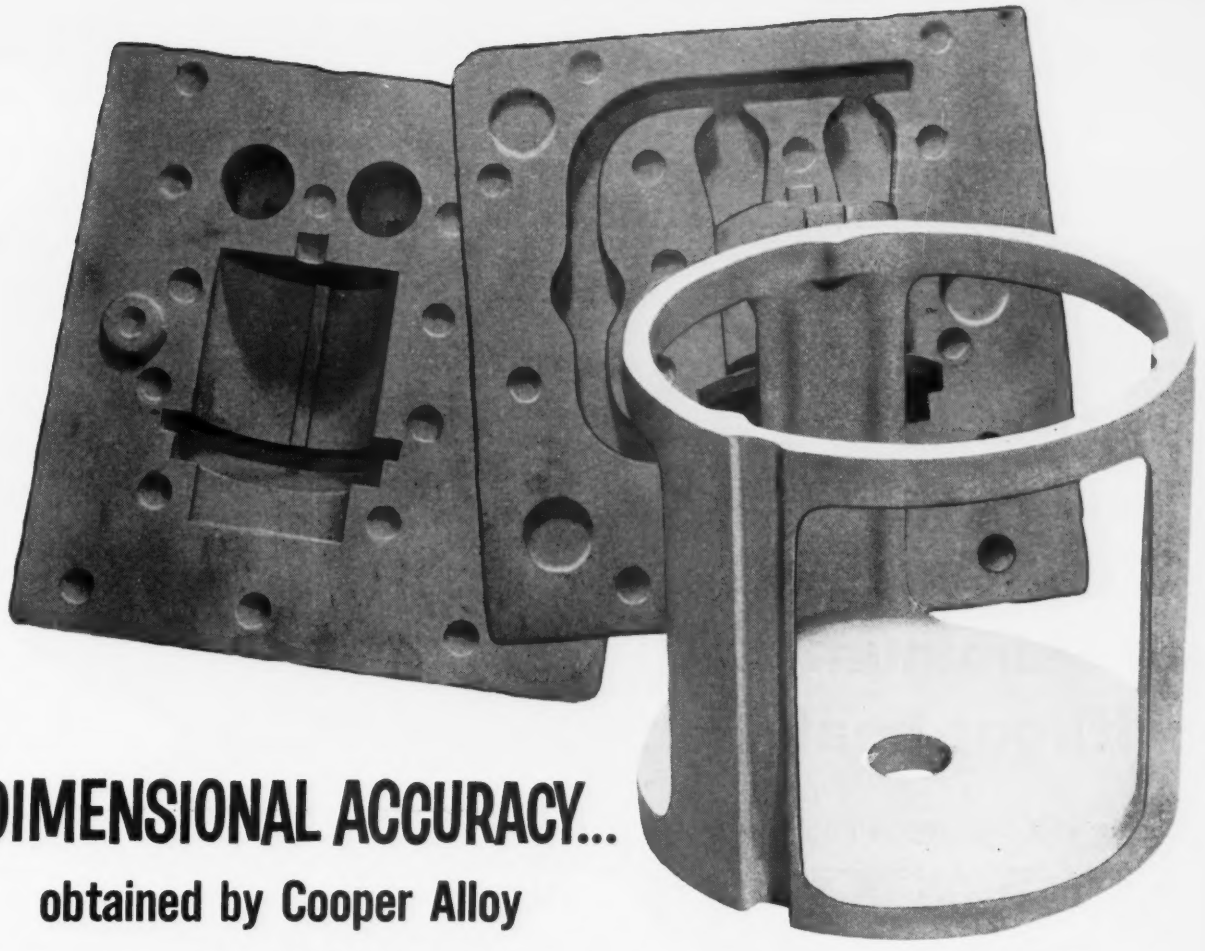
Virtually none of the equipment is idle or superfluous. Considerable thought was given to the choice of equipment, allocation of space and selection of personnel. The result is an effective combination for pursuit of problems in the research staff's experimental foundry.

Magnesium Association Elects Officers and Directors

Minor changes were made in the slate of officers of the Magnesium Association at its annual meeting in Colorado Springs, Colo., May 31 and June 1.

D. T. Wellman, president, Wellman Bronze & Aluminum Co., Cleveland, was re-elected president. J. E. Pepall, president, Magnesium Co. of Canada, was re-elected vice president and P. B. Craighead, president, Magnesium Products of Milwaukee, also was elected a vice president. James V. Cosman, president, Superior Bearing Bronze Co., Wood-Ridge, N. J., was re-elected treasurer.

Named as directors for the coming year were S. E. Bohn, Howard Foundry Co.; Wiser Brown, Aluminum Co. of America; E. S. Christiansen, Magnesium Co. of America; P. B. Craighead, Magnesium Products of Milwaukee; A. Christello, American Light Alloys Inc.; R. D. Ferguson, Bendix Foundries; Otis E. Grant, Magnode Products Inc.; J. D. Hanawalt, Dow Chemical Co.; J. B. Heisler, A. C. Williams Co.; C. E. Larson,



DIMENSIONAL ACCURACY...

obtained by Cooper Alloy

through SHELL MOLDING with G-E Shell Molding Resins

This stainless steel instrument housing, cast for a customer by Cooper Alloy Corporation, Hillside, N. J., was one of those "impossible" jobs. Previous experience by the customer had resulted in shrink defects in the lugs on the open face, rendering the castings unacceptable. The job was further complicated by the fact that dimensions and finish were equally critical on both exterior and interior surfaces.

Through shell molding and advanced foundry techniques, Cooper Alloy was able to convert this "impossible" job to a standard production run! Hollow shell cores achieved the required accuracy and finish for the casting's interior; the Shellcast* process accomplished similar results for the exterior. G-E shell molding resins helped Cooper Alloy obtain close dimensional accuracy, fine finish and uniform soundness.

How can shell molding help YOU?

Cooper Alloy uses *General Electric shell molding resins* in its Shellcast process, relying on them for batch-to-batch uniformity and correctly balanced properties. Other G-E products for shell molding include: *G-E silicone release agents* to release molds easily from patterns and *G-E phenolic bonding resin* to assemble shell halves together.

Progress Is Our Most Important Product

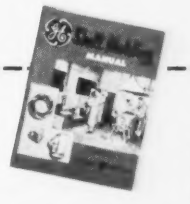
GENERAL ELECTRIC

Ask G.E. about shell molding!

General Electric maintains a shell molding laboratory in Pittsfield, Mass., to help users and prospective users of shell molding solve problems and evaluate the process. G.E. also offers a 28-page manual describing the techniques and benefits of this new foundry method. *Just mail the coupon for a free copy!*

*Reg. trademark, Cooper Alloy Corporation

FREE SHELL MOLDING MANUAL!



General Electric Company
Section 6F4A1
Chemical and Metallurgical Division
Pittsfield, Massachusetts

Please send me a free copy of *G-E Shell Molding Manual.*

( ) We are presently using the shell molding process.
( ) We are interested in the shell molding process.

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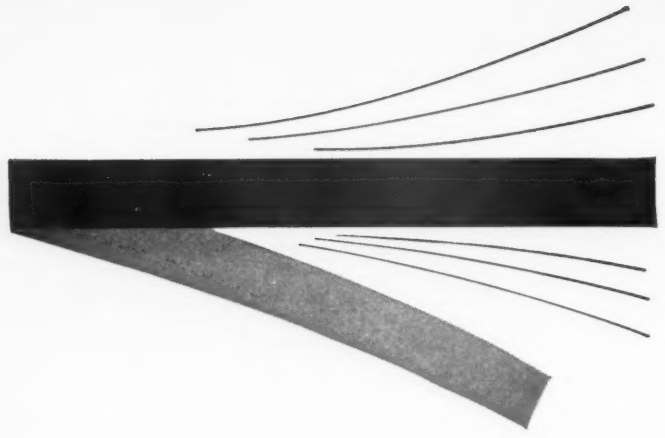

25,000 psi yield strength in aluminum castings without heat treatment

Federated's Tenzaloy, self-aging aluminum alloy, has an unusually desirable combination of properties, including exceptionally high yield strength, which is the best measure of ability to take punishment without failure.

Here are typical properties of Tenzaloy castings aged 10-14 days at room temperature:

Yield Strength, psi (.02% offset)	**25,000**
Tensile Strength, psi	**35,000**
Brinell Hardness Number	**74**

Tenzaloy has other unique properties that help make it the most widely used of all high-strength, self-aging aluminum alloys; it takes a fine anodized finish, it has excellent machinability, it has superior corrosion resistance, and it can be brazed by standard techniques.

Ask your Federated salesman to tell you how and where foundries are successfully and profitably using Tenzaloy. Or write us directly for a complete pamphlet on the alloy and its properties.

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White Metal Rolling & Stamping Co.; W. H. Osborne, Acme Aluminum Foundry Co.; J. E. Pepall, Magnesium Co. of Canada; E. H. Perkins, Brooks & Perkins Inc.; R. D. Taylor, Federated Metals Div., American Smelting & Refining Co.; and John Thomson, Dominion Magnesium Ltd.

Jerry Singleton continues as executive secretary of the association, which has its headquarters at 122 East 42nd St., New York.

Steel Founders' Society Opens Its 1956 Safety Competition

The 1956 national Steel Foundry Safety Contest began June 1 and will run through August. Sponsored annually by the Steel Founders' Society of America, the contest is open to all foundries engaged in making steel castings.

Competing groups are divided by exposure man-hours: Below 30,000; 31 to 55,000; 56 to 100,000; and 101,000 or more. Rules of the American Standards Association apply in the determination of lost-time injury frequency rates. Other regulations which govern the competition are available from the safety committee of the society, at 606 Terminal Tower, Cleveland 13.

Each year, several foundries receive "Highest Honor Safety Award" certificates for having maintained accident-free records during the contest period. A "Certificate of Safety Achievement" is awarded to each foundry with a frequency rate of 10.0 or less, and honorable mention is given to companies with substantial improvements over their records for the previous year.

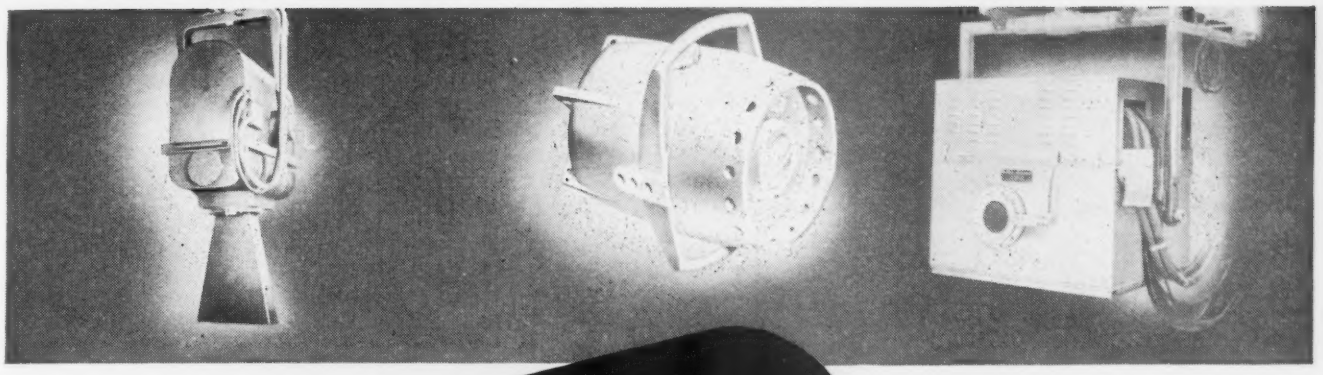
The safety committee of SFSA also has announced the winners of its 1956 safety poster contest, in which 327 entries were received from 72 different companies. All are the work of employees of steel foundries.

From the entries, four were selected as national winners: Benjamin Avery and Earl Hedgepath, Oklahoma Steel Castings Co., Tulsa, Okla.; Miss Irma Burke, Blaw-Knox Co., Continental Foundry & Machine Division, East Chicago, Ind.; and Anthony J. Norris, General Steel Castings Corp., Eddystone, Pa.

National winners were selected from the following divisional winners:

Division I — Mr. Norris; R. A. Hershberger, Lebanon Steel Co., Lebanon, Pa.; and J. Lacombe, Canadian Car & Foundry Co., Montreal, Que.

Division II—Reginald Wheeler, Do-



New Kodak X-ray Film

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Kodak Industrial X-ray Film, Type AA

Read what the new Kodak Industrial X-ray Film, Type AA, will do for you.

- Reduces exposure time—speeds up routine examinations.
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- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Shortens processing cycle with existing exposure technics.
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Here is a brand-new x-ray film that gives you greatly increased film speeds. It is a film that retains the fine sensitivity characteristics which have made Kodak Type A the most widely used x-ray film in industry. Then in addition it gives speeds up to more than double those of Type A.

This means that you can cut down exposure time, handle routine examinations more quickly.

Your x-ray dealer and the Kodak Technical Representative are ready to tell you all about this new film. Get in touch with them. See what it will mean to you.

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minion Foundries & Steel Ltd., Hamilton, Ont.; Donald Clamp, Pratt & Letchworth Division, Buffalo; and J. Watchol, Tonawanda Electric Steel Casting Corp., North Tonawanda, N. Y.

Division III—Mr. Avery, Haskell Prater and Mr. Hedgepath, Oklahoma Steel Castings Co.

Division IV—Nick Pugliese, Blaw-Knox Co., Union Steel Castings Division, Pittsburgh; Miss Ellen L. Von Stein, Blaw-Knox Co., Continental Foundry & Machine Division, Coraopolis, Pa.; and William N. Burgess, American Steel Foundries, Verona, Pa.

Division V—Ham Miller and Ralph Slusser, Ohio Steel Foundry Co., Springfield, O.; and Alvin Robinson, Sawbrook Steel Castings Co., Cincinnati.

Division VI—D. E. Wallbug, National Malleable & Steel Castings Co., Melrose Park, Ill.; Miss Burke; and Webb Weidenhammer, Harrison Steel Castings Co., Attica, Ind.

Division VII—Ward Goff, Scullin Steel Co., St. Louis; R. L. Lich, General Steel Castings Corp., Granite City, Ill.; and Davis McGowan, St. Louis Steel Castings Co., St. Louis.

Division VIII (Northwest)—Carlos Monroe, Electric Steel Foundry Co., Portland, Oreg.; Ernie Harding, Canadian Sumner Iron Works Ltd., Vancouver, B. C.; and Spencer Mitchell, Washington Iron Works, Seattle.

Division VIII (California) — Jim Farrell, Hanford Foundry Co., San Bernardino; C. J. Diamantopoulos, Westlectric Castings Inc., Los Angeles; and Bud Gordon, Alloy Steel & Metals Co., Los Angeles.

Vacation Safety Is the Theme Of New Booklet and Film

Vacation safety is the theme of a new booklet and of a new film produced by the National Safety Council, 425 North Michigan Ave., Chicago 11.

The booklet, *Have a Good Time,* is a reminder to give employees on the eve of their vacations. It shows them how to enjoy time away from the job and come back safe and sound. Colorful drawings illustrate safe rules of driving, swimming, camping and other vacation activities.

"Vacation Safety," a ten-minute, sound-motion picture, entertains while it teaches workers how to relax safely. It shows the vacation-bound employee how to avoid the special hazards of travel, camping and strenuous athletic activities. It stresses the responsibilities of the head of the house to his family during the period when he is their safety director.

For a sample of the booklet and for further information on the film, write to the National Safety Council.

Issues Statistics on End-Use of Aluminum Castings

End-use statistics on aluminum castings released by the Aluminum Association, New York, indicate that 72.8 per cent of permanent mold castings shipped by association members during the last six months of 1955 went to the transportation-motor vehicle field.

The biggest user of aluminum sand castings made by association members during the same period also was transportation-motor vehicles, which took 26.7 per cent. In the case of sand castings, national defense and industrial and commercial machines, equipment and tools took only slightly lower percentages—22.2 and 22.6 per cent respectively.

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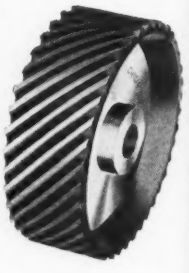
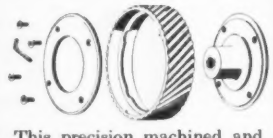
The R54 contact wheel has proved again and again in shops all over the country and abroad that our original claim "cuts cost like magic" is really doing just that. It cuts better, faster, longer and increases abrasive belt life—for substantial savings. And equally important—better quality work. Write for descriptive literature.





This precision machined and accurately balanced wheel is easily and quickly knocked down and reassembled for economical tire replacement or change.

You replace only the tire when necessary and not the entire wheel. Choose from a complete assortment of treads in a wide variety of Durometers to best suit your grinding or polishing requirements. Our engineers will gladly make specific recommendations.

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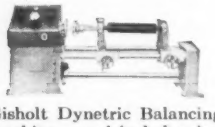
All Chicago Rubber wheels are assured perfect dynamic balance for safety and efficiency on the job.



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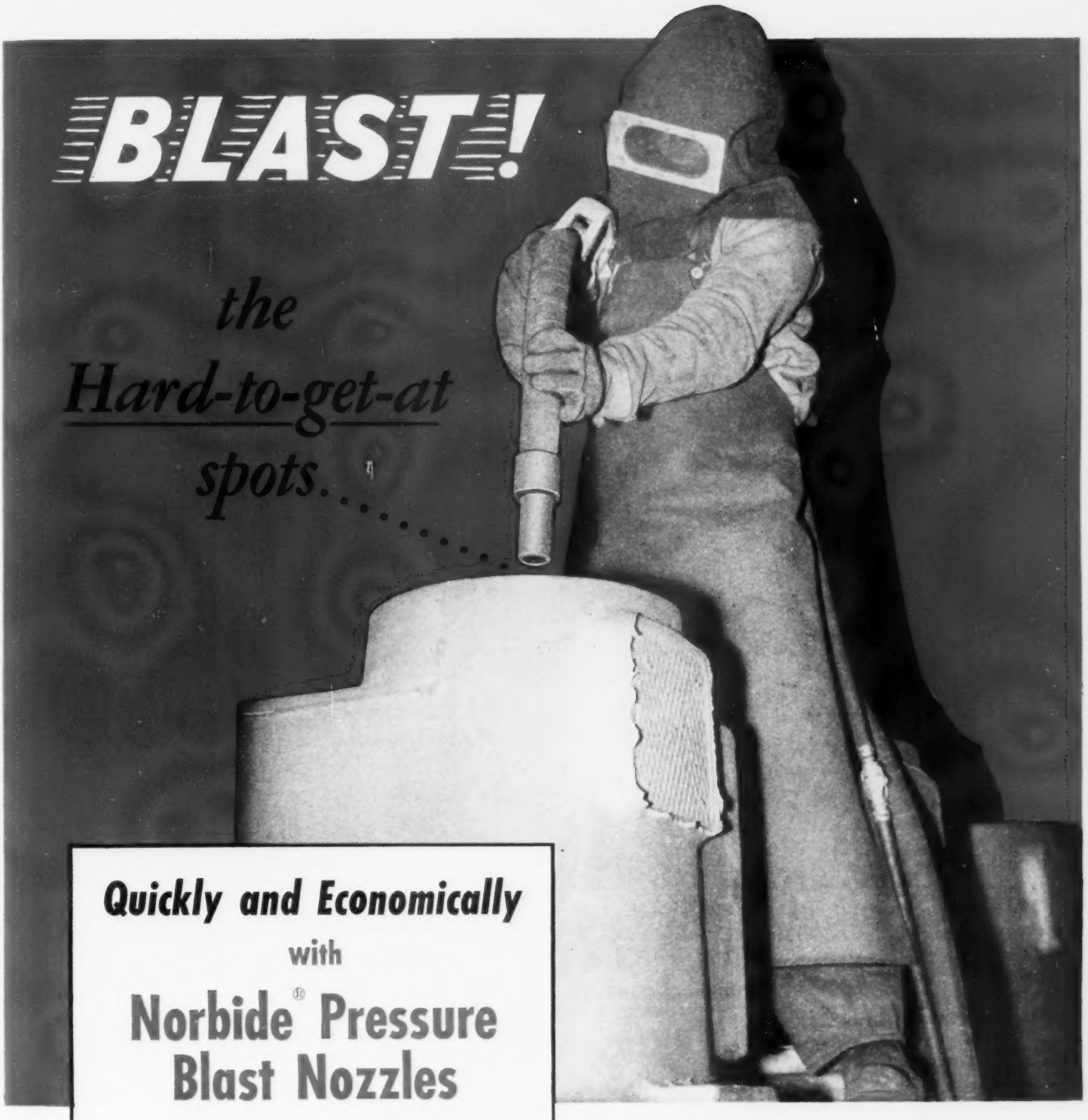

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FOUNDREZ 7500 is a very finely powdered thermosetting phenolic resin. You will find that it blends easily, gives uniform shell mold structure and strength in economical sand-to-resin ratios.

When you produce shell molds with FOUNDREZ 7500, you reduce curing cycles. This remarkable RCI resin performs satisfactorily at extremely high oven temperatures, lets you turn out more molds per hour.

While FOUNDREZ 7500 works well in almost all applications, it is especially recommended for tough and intricate jobs where the patterns have a deep draw, and where the sand must flow, fill and bake extra well.

FOUNDREZ 7500-4 is very similar to FOUNDREZ 7500 but is faster setting and intended for use in high speed production. It generally gives a more rigid shell mold than FOUNDREZ 7500.

For large and small parts cast with any ferrous or non-ferrous material, shell molding with FOUNDREZ 7500 and 7500-4 is ideal ... particularly for long production runs. RCI offers technical help. Get complete data by writing for *Technical Bulletin F-3.*

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Your Partner in Progress

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Synthetic Resins • Chemical Colors • Industrial Adhesives • Plasticizers
Phenol • Formaldehyde • Glycerine • Phthalic Anhydride • Maleic Anhydride
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REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

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Industry Briefs

HARVILL CORP., Los Angeles, said to be the largest die casting firm in the West, has acquired 30 acres of land in Santa Ana, Calif., where it will construct a 125,000-sq-ft plant that will increase production capacity 70 per cent. Construction will begin soon and is scheduled for completion in January, 1957. The new site was acquired from McCulloch Motors Corp., Los Angeles, in exchange for the Los Angeles property presently occupied by Harvill. McCulloch acquires buildings totaling 75,000 sq ft and over 8 acres of land adjacent to its present site. It will put the property to immediate use. The new Harvill plant will house the company's die casting facilities and its Tork-Master and Harv-O-Matic Divisions.

Electro Metallurgical Co., a Division of Union Carbide & Carbon Corp., New York, has consolidated its metallurgical services in a Metallurgical Services Division with headquarters at 1300 Lakeside Ave., Cleveland. New appointments in the division include H. P. Rassbach, manager; R. A. Clark, manager, foundry service; R. J. Portmann, manager, open-hearth service; and H. C. Aufderhaar, assistant to the manager. Mr. Rassbach also, for the time being, will handle electric furnace service.

Hyster Co., Portland, Oreg., will construct a new plant for the manufacture of industrial lift truck and tractor equipment on a 42-acre site on East Voorhees St. in Danville, Ill. Plans call for production to continue at both the present Danville plant on Myers St. and in the new facilities.

Gordon S. DeBoskey Co., 115 North William St., South Bend 1, Ind., has enlarged its offices and will maintain a full-time office staff. The firm has sold Samuel Greenfield Co. brass, bronze and aluminum alloy ingot in Michigan, Indiana and Illinois for nine years.

American Chain & Cable Co., Bridgeport, Conn., has opened new facilities at 2250 Noblestown Rd., Pittsburgh 5. District representatives for the following divisions will be located at the new office: American Cable, American Chain, Ford Chain Block, Hazard Wire Rope, Pennsylvania Lawn Mower, RP&C Valve and Wright Hoist. American Cable and Hazard Wire Rope Divisions also will maintain warehouse stock there.

Laclede-Christy Co. Division, H. K. Porter Co., St. Louis, plans to spend $1½ million in an expansion program. New equipment will be installed in the Christy Plant, St. Louis, and also at Clearfield, Pa., and Bessemer, Ala. A new fine-grinding pilot plant has been constructed at the Laclede Plant, St. Louis. More manufacturing facilities will be added and supplemented in Ottawa, Ill., and Canon City, Colo.

American MonoRail Co., Cleveland, has appointed the following distributors: Cardinal Carryor Co., 930 East Mason St., Louisville 4, for Kentucky and the lower counties of Indiana; Kistler Industrial Service, 902 South Central Ave., Phoenix, Ariz., for Arizona and New Mexico; and Grover Engineers, 44 McLea Court, San Francisco, for the upper counties of California.

Torit Mfg. Co., St. Paul, manufacturer of dust collectors, has named three new district sales representatives to handle its products. They are Taze & Hewitt, Baltimore, covering Maryland; Union Supply Co., Denver, in Colorado and eastern Wyoming; and Byron Confer, Indianapolis, in southern Indiana and most of Kentucky.

Beryllium Corp., Reading, Pa., has opened a new warehouse at 17187 Wyoming Ave., Detroit. The warehouse carries complete stocks of the company's beryllium copper master alloys, casting ingots, rod, bar and billets and will stock particular alloys, sizes and shapes of parts used by its customers.

Garrett Supply Co., division of Garrett Corp., Los Angeles, has added grinding wheels made by Norton Co., Worcester, Mass., to the lines of industrial supplies it handles. The company also will maintain a staff of factory-trained abrasive specialists who will be available for outside consultation on grinding problems.

Shieldalloy Corp., producers of pure chromium metal and master alloys, powdered ferroalloys and processed minerals, has transferred its sales organization to its plant in Newfield, N. J. Executive offices continue at 99 Park Ave., New York.

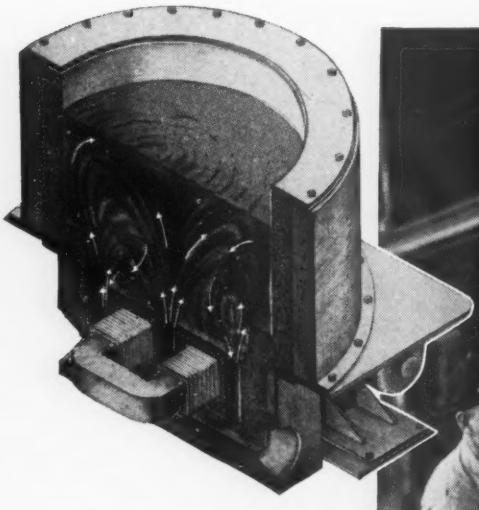
U. S. Industrial Chemicals Co., Division of National Distillers Products Corp., New York, expects to complete by July, 1957, a plant at Ashtabula, O., to produce 1½ million lb per year of reactor grade zirconium sponge.

Electrode Division, Great Lakes Carbon Corp., New York, plans to add more than 45 per cent to its annual production capacity for carbon and graphite electrodes, anodes,

BACK TO SCHOOL: A service school on Allis-Chalmers material handling equipment was held by the company recently in Chicago for personnel from its factory branches, which now supervise sales and service and those products. The illustration above shows the branch men with representatives of the home office in Milwaukee and the Harvey, Ill., plant at the opening of the school

Hard-to-melt Bronzes Successfully Handled
in
AJAX INDUCTION FURNACES

Brass and bronze foundries all over the country have found AJAX-TAMA-WYATT induction furnaces a reliable tool for melting silicon bronzes, aluminum bronzes, leaded bronzes, phosphor bronzes, and other high strength alloys. Operation is highly economical due to the good uniformity of the alloys, low ratio of rejects, drastic reduction of metal losses, and clean operating conditions. This recent development opens the field for the use of AJAX induction furnaces in all foundries where difficult-to-melt alloys are handled.



Cross section of AJAX-TAMA-WYATT twin coil induction furnace such as used at the Torrance Brass Foundry. Heat is produced within the molten metal in the secondary channels and conveyed throughout the melt by electromagnetic circulation, resulting in minimum metal losses and high uniformity of alloy. Temperature is automatically controlled.

(Photograph courtesy of Long Beach Press-Telegram, Long Beach, Cal.)

The furnace pictured here is melting aluminum bronze at the *Torrance Brass Foundry, Torrance, Cal.*, operating at a temperature of 2400 F, for the production of high strength centrifugal castings. This unit is rated 100 kw. Note also the clean, smokeless operation as shown in the unretouched photograph.

AJAX

TAMA-WYATT

AJAX ENGINEERING CORP., TRENTON 7, N. J.

INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting

Circle 644 on Inquiry Card

mold stock and graphite specialties. The new facilities will be added at the division's plants in Morganton, N. C., and Niagara Falls, N. Y., and are scheduled for completion in May, 1957.

Pittsburgh Coke & Chemical Co., Pittsburgh, has formed Neville Ferro Alloy Co., a wholly owned subsidiary, to produce and market ferromanganese and other ferroalloys for the steel industry. Pittsburgh Coke has facilities available for production of ferromanganese at Neville Island, Pa., and at Struthers, O. Present plans call for production to start late in 1956.

Air Reduction Co. has moved its executive offices to the third and fourth floors of the new Socony-Mobil Building, at 150 East 42nd St., New York 17. For the last 26 years, the offices were located at 60 East 42nd St., New York.

Mallinckrodt Chemical Works, St. Louis 7, is making cerium metal available for experimental work in the metal industries. Limited quantities of the metal (95 per cent minimum Ce) are being offered in the form of 1-pound piglets.

Arwood Precision Casting Corp. has moved its executive offices to 321 West 44th St., New York 36. The company's Brooklyn plant still is located at 70 Washington St., Brooklyn 1, N. Y.

Baker-Raulang Co., Cleveland, has appointed Mechanical Handling Co., 1401 West Garfield St., Seattle 39, to distribute its complete line of industrial trucks in Seattle and western Washington.

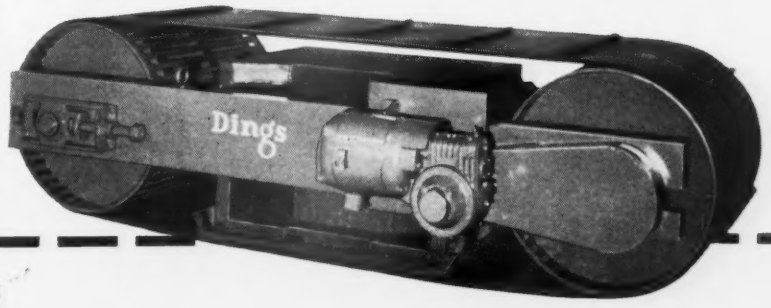
Withrow Die Casting Co. has moved into a new 18,000-sq-ft plant at 13164 Leadwell St., North Hollywood, Calif, The company formerly was located in Burbank, Calif.

William K. Duff Co., New England representatives for Holcroft & Co., heat treat furnace manufacturer, has moved from Darien, Conn., to the Post Office Bldg., Avon, Conn.

International Nickel Co. has moved the office of the Detroit Technical Section of the company's Development and Research Division to 19842 James Couzens Highway, Detroit 35.

Carboloy Dept. of General Electric Co., Detroit, has moved its West Coast headquarters to 2106 West Washington Blvd., Los Angeles.

Get Higher Production--
Make More Profit--
by using
DINGS SELF-CLEANING
RECTANGULAR MAGNETS



POSITIVE TRAMP IRON PROTECTION

Suspend a Dings Self-Cleaning Rectangular Magnet over your conveyors and *be sure* of protecting your equipment from tramp iron damage. Operating automatically and constantly, these Self-Cleaning Magnets pull tramp iron of any shape out of deep burdens on the fastest moving belts. Dings suspended "In Line" Magnets, which pick up and discharge tramp metal in the direction of material flow, are particularly effective for quickly removing long rods from sand before the trailing edge can damage the conveyor belt.

STEADY HIGH PRODUCTION

With a Dings Self-Cleaning Rectangular Magnet on the job, there are no production delays for hand removal of tramp iron . . . no downtime for repairing damage to machinery caused by tramp iron. Self-cleaning magnets discharge accumulated iron automatically . . . no manual labor required.

PROFITABLE SCRAP SALES

There's a growing need today for scrap metal to meet the demands of an expected record steel production year. You can add to your profits by turning recovered tramp iron into money.

Write for Catalog C-5000B for details about magnetic equipment for foundries . . .

ASK ABOUT THESE OTHER DINGS MONEY-SAVERS

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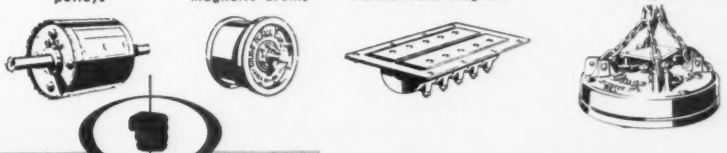

Dings

DINGS MAGNETIC SEPARATOR CO.
4708 West Electric Avenue
Milwaukee 46, Wisconsin

RM156-2/3

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Next Page—ITEM 646→

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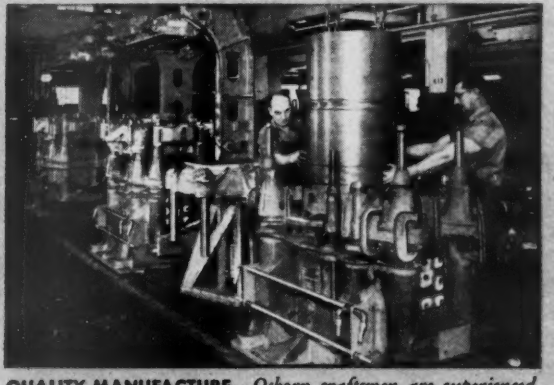


QUALITY MANUFACTURE—*Osborn craftsmen are experienced in manufacturing foundry machines that assure dependable performance . . . day after day.*

Leader in automation for the foundry

OSBORN

CORE BLOWERS MOLDING MACHINES

INDUSTRIAL BRUSHES

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

WHAT might be termed a new twist in the investment molding process is a development by a New Englander. It employs other than conventional materials for the expendable pattern and investment mold. The pattern is made from foamed or expanded polystyrene and the investment material is green molding sand.

The polystyrene material, familiar to us as the bright, white blocks or pieces forming the foundation for floral and other displays, is available in board and plank form, and is fabricated into the desired pattern by conventional sawing, cutting and joining. The pattern, including gates and sprues, is molded in green sand with more venting than is required for ordinary green sand practice. Pattern and gating system are left in the mold, and the molten metal poured in the sprue. Contact of molten metal with polystyrene vaporizes the latter, leaving a cavity which is filled by the metal.

The process was developed by H. F. Shroyer, P. O. Box 150, Mystic, Conn., and it is said to be suitable for making both ferrous and nonferrous castings. It might be pointed out that a polystyrene granular material is available which can be foamed or expanded into place or form by placing it in a mold and applying heat—a possibility for production operations.

Measures Gas

ONE result of extensive investigations on gas in light metals by Dr. Ransley, British Aluminum Laboratories, has been the development of an instrument for direct determination of hydrogen content of melts, according to John Gotheridge, Foundry Services Inc., Columbus, O. The instrument is used similarly to an immersion pyrometer, and within 30 to 60 seconds the gas content in ml/100 grams of metal may be ascertained.

The technique principle is based on the law of partial pressures. A small quantity of dry nitrogen—approximately 2 ml—is recirculated through the molten light metal alloy until the partial pressure of hydrogen in the nitrogen is equivalent to that in the melt, and as a consequence the hydrogen content of the nitrogen becomes a direct measure of the gas content of the melt. Hydrogen content of the nitrogen is determined by electrical conductivity measurement, with the millivoltmeter in the circuit calibrated directly in ml of H_2 per 100 grams of metal.

Helps Squeeze

INDICATIONS are that in diaphragm molding where deep pockets are involved, cementing suitable projections on the diaphragm over the particular areas aids considerably in compacting the sand at such points. One investigator looking into the possibilities of such application reported that in lieu of more suitable material, that ubiquitous commodity referred to as the "falsie" was tried. It functioned effectively.

Quick Cure

SPEEDY procedure for curing or polymerizing cores bonded with resin was demonstrated by Borden Co., at the recent AFS Show at Atlantic City. Sand mixed with 2 per cent liquid urea resin and 1 per cent water was mulled 4 to 5 minutes, and then blown into a corebox following conventional practice. Corebox with its contained core was removed from the machine, placed on a bench, and covered with a diaphragm through which hot compressed air at shop pressure and 400°F temperature was admitted. Vents in the bottom of the corebox permit the hot air to permeate the core. Air is heated by passing through a chamber containing electrically heated resistance coils. By the procedure an 8-lb core was cured in 45 seconds.

Gives Properties

HEAT-TREATED properties of 24 alpha-beta titanium alloys are evaluated in a research report for the Air Force just released through the Office of Technical Services, Department of Commerce, Washington 25. Manganese, molybdenum and vanadium were the principal alloying additions, and the strength-ductility relationships increased with increasing alloy content up to about 7 per cent alloy addition. Report is PB 111988, "Development of Improved Titanium-Base Alloys" by Robinson, Parris and Frost, and the price $2.75.

Heat Losses

STUDY of temperature drop in pouring ladles conducted on the Heat and Mass Flow Analyzer at Columbia University, and reported by Paschkis at the annual AFS convention held at Atlantic City indicates that preheating of ladles is essential. In preheating to a certain temperature time plays an important role, and proper preheating to a given inside temperature can be considered complete only when the lining is fully soaked with heat as indicated by no further rise in outside temperature. Considerable part of heat losses occur from the top of the ladle, and use of a lid is desirable. Increasing lining thickness beyond 1 in. for 150-lb ladles or beyond 6 in. for 16,000-lb ladles is practically without significance for preheat temperatures not exceeding 2100°F.

Strong Stuff

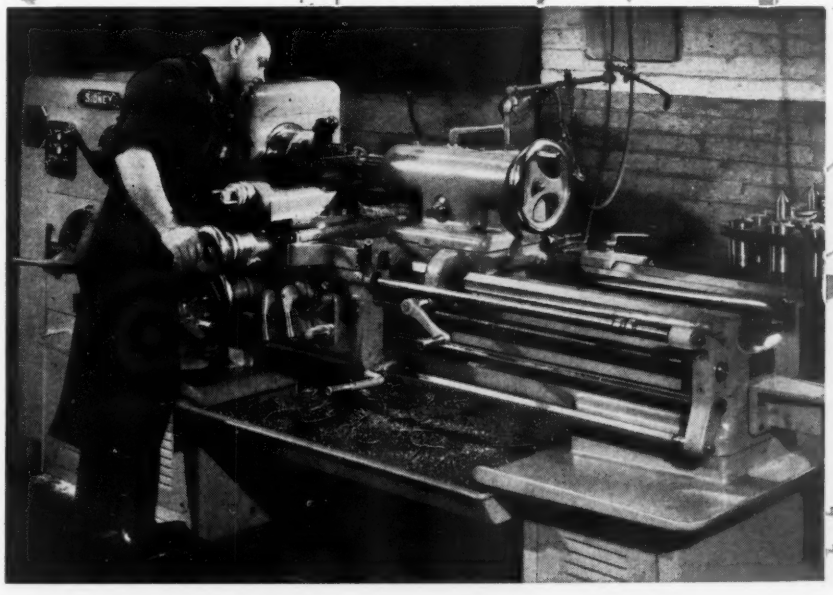
RECENT modifications of General Electric Co.'s methods for making "perfect" iron crystals have produced tiny whiskers with tensile strengths as high as 1,900,000 psi, according to Dr. J. Herbert Hollomon, manager of metallurgy and ceramics at the firm's Research Laboratory, Schenectady, N. Y. Although these crystals are too small to be practical, being less than an inch long and smaller than a human hair in diameter, recent studies have shown a possibility of making large crystals free of defects.

Testing Coke

MECHANICAL strength of coke at room temperature gives no indication of strength at higher temperatures encountered in cupola operation, according to Varga and Lownie in a paper presented at the AFS annual convention. Statement is based on investigations in which several cokes were tested at temperatures as high as 2500°F.

Facing Page—ITEM 647→

LET US TELL YOU ABOUT OUR OPERATION



Husky performance features of this Sydney Lathe with 6" spindle typify pattern production facilities at Pyle. Unusual range of equipment in the skilled hands of veteran personnel assures fast, smooth flow of patterns to meet specifications as well as shipping dates.

Patternmaking at Pyle may not embrace all the drama of surgery . . . but pinpoint precision and devotion to detail are just as important here as in the operating room.

At Pyle your pattern is prepared by men averaging 19 years experience. From a minutely accurate wooden model, it is cast in our own foundry — designed, equipped and operated exclusively for pattern production. The aluminum or magnesium casting is then tooled on machines best suited to your needs . . . lathes, radial drills, milling machines, planers, hydraulic or automatic duplicators. Flawlessly hand-finished and meticulously inspected, it is shipped to meet your deadline.

The consistent thoroughness of our operation has won us friends among America's most respected firms. May we become friends with you?

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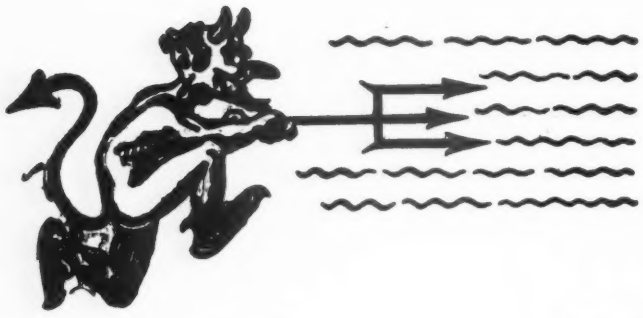
PATTERN AND MANUFACTURING COMPANY

Muskegon, Michigan

Produce More Castings Per Heat with



Soffel's THERMOTOMIC® "HOTOP" LIQUIDIZER

Exothermic Carbon Free Liquidizer For Iron, Steel, Nodular Iron

This new head compound saves feeding metal in risers or feeding heads which can now be reduced in height 40 to 70%

SOFFEL'S THERMOTOMIC "HOTOP" CARBON FREE LIQUIDIZER is different from other head compounds in that "HOTOP" LIQUIDIZER does NOT contain powdered metal, is NOT a thermit compound. It is a patented exothermic compound entirely free of carbon, sulfur and phosphorus and can be used without danger of contamination on any ferrous metal or alloy.

"HOTOP" LIQUIDIZER also saves molding time as less sand is needed in the mold cope due to short height of risers. "HOTOP" LIQUIDIZER produces a liquid slag well over 4000° F. of heat and insulates the metal. The feeding metal will remain liquid at least 50% longer assuring adequate feeding while the casting cools and solidifies. Piping and shrink cavities caused by premature freezing of the feeding metal are eliminated.

THERMOTOMIC HOTOP LIQUIDIZER BRAND "B" SHOULD BE USED ON RISERS UNDER 4 INCHES IN DIAMETER GUARANTEED TO PRODUCE SOLID CLEAN CASTINGS

SOFFEL'S FAMOUS Carbon Free LIQUIDIZER FOR ALL METALS and ALLOYS

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is the leader in major foundries for use on both ferrous and non-ferrous metals and also in ingot production. It is the original scientific non-carbon, exothermic compound for feeding heads and risers.

When applied on the heads or risers, CARBON FREE LIQUIDIZER reacts within itself exothermically, producing a temperature above 3200° F. It actually increases the temperature of the feeding metal to a point well above that of the metal in the main body of the casting, thus ensuring that the feeding metal will be the last to freeze. In this manner, shrink cavities in the casting caused by premature freezing of the feeding heads will be eliminated. After the exothermic action has ceased, the LIQUIDIZER forms a soft refractory insulating blanket on the metal. This confines the heat generated by the LIQUIDIZER and aids in maintaining the desired high temperature of the feeding metal in the heads or risers.

SOFFEL'S THERMOTOMIC COMPOUND

PATENTED

FOR ALL METALS and ALLOYS

THERMOTOMIC COMPOUND is a patented Exothermic compound that can be molded into any desired shapes and used as feeding ring inserts under risers or as facing application where it is desired to maintain fluidity of the casting metal. THERMOTOMIC permits reversal of the trend towards large feeding heads and risers, making it possible to use heads that are shorter and more compact with 1½" feeder openings.

This permits easy removal of the casting feeding heads and sharp reductions in cleaning and finishing costs. When THERMOTOMIC is used as inserts or as facing mixing with molding sand in the mold, heat at thin metal sections is retained until the thick main body of the casting has solidified, thus eliminating shrink cracks and improving grain structure and tensile strength. For use in green sand molds, use THERMOTOMIC W. P. (Waterproofed)

NOTE: SOFFEL'S CARBON FREE LIQUIDIZER NO. 5 is recommended for use on top of feeding heads in conjunction with THERMOTOMIC COMPOUND. For aluminum castings, use THERMOTOMIC ABC and AL-X31 LIQUIDIZER. When ordering a trial sample, advise the kind of metal to be used on.

U. S. Patents No. 2,490,327 and No. 2,500,097

PITTSBURGH METALS PURIFYING COMPANY

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WORLD'S LARGEST MANUFACTURER OF FLUXES AND PURIFIERS FOR ALL METALS AND ALLOYS

INVESTMENT CASTERS MEET IN NEW YORK

Hold Technical and Business Sessions

By ROBERT H. HERRMANN
Associate Editor

THE Investment Casting Institute's spring meeting was held at Hotel New Yorker, New York, May 10-11 with 120 attending. One day was devoted to a technical session, and business topics were discussed on the second day.

Roger F. Waindle, Wai-Met Engineering Co., Detroit, started the technical session with a report on work of the metal specifications committee. One of the reasons for ICI specifications is to offer a guide to designers and engineers in converting parts from other fabrication methods to investment castings. It also is intended that the specifications become a part of the contract between customer and foundry. The committee report, however, cautioned ICI members that test bar values show only metal properties and are not necessarily representative of casting properties.

Production of High-Strength Steel Castings—Geoffrey W. Paget, Precision Casting Dept., Deloro-Stellite, Belleville, Ont. High-stress, investment-cast steel aircraft parts such as levers and brackets for flight controls were discussed. Chromium-molybdenum steel was used. Work was described on test bar examinations, foundry procedures and gating and pouring techniques. It was found that sulphur and phosphorus contents in the alloys had great effect on strength properties. Close control of these and other elements, sound metallurgical practice and good foundry techniques produced castings acceptable for aircraft use.

Decarburization in Investment Casting—Nicholas J. Grant, Department of Metallurgy, Massachusetts Institute of Technology. Decarburization occurs in ferrous castings when carbon is removed from the surface skin. It results in reduction of metal hardness, poor heat-treating characteristics, lowered fatigue strength and a surface which will not take hard coatings.

Steels containing less than 0.8 per cent carbon suffer comparatively little carburization; those containing more carbon are damaged to a greater extent. Also carburization is influenced by the temperature at which it occurs, time at that temperature, the carbon present in the metal, alloy content of the metal and the atmosphere during casting and heat treating. In the case of investment casting, oxygen is the principal cause of decarburization.

Investment Precision Casting — Methods and Possibilities of the Shaw Process—Adam Dunlop, Shaw Process Ltd., Newcastle on Tyne, England. Presented by Mr. Paget. The Shaw process involves use of a mold material consisting of ethyl silicate and a refractory which passes through a pliable stage during solidification. It can be stripped off a pattern having slight undercuts. Molds are ignited for drying.

Molds may be poured cold or heated to 1940°F. Rate of mold heating or cooling has no effect. Iron, steel, aluminum, brass and bronze, cobalt-base and nickel-base alloys have been cast successfully. Castings weighing several hundred pounds are produced regularly, and a 700-lb steel casting has been made.

Tolerances of 0.005 in. per in. with

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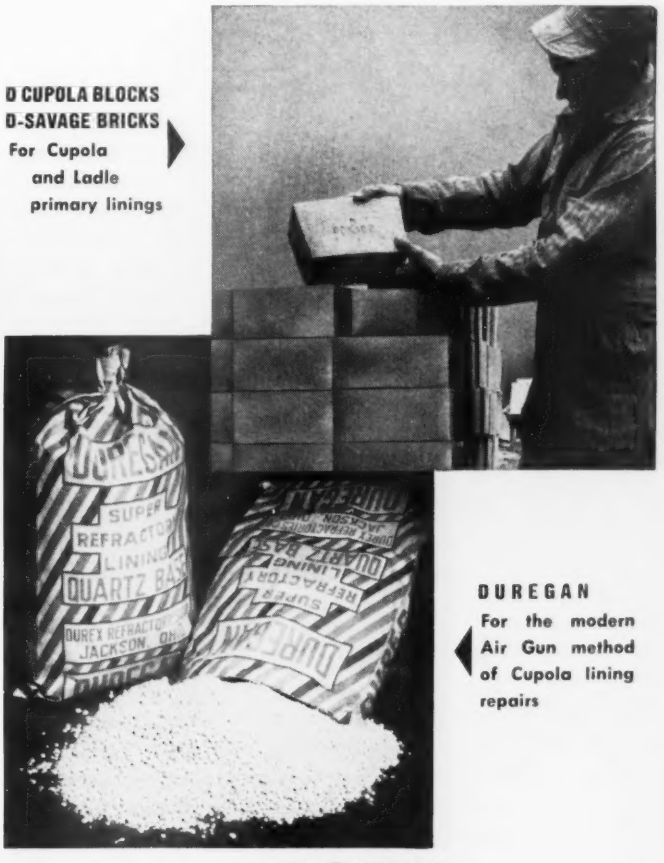
For Cupola and Ladle primary linings



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Both the primary lining and the modern air placement repair material, can be furnished from our plant in the same carload. Our ability to furnish *both* of these distinctly different products from the same plant, enables individual foundries to minimize their inventories without necessitating l.c.l. shipments at higher costs.

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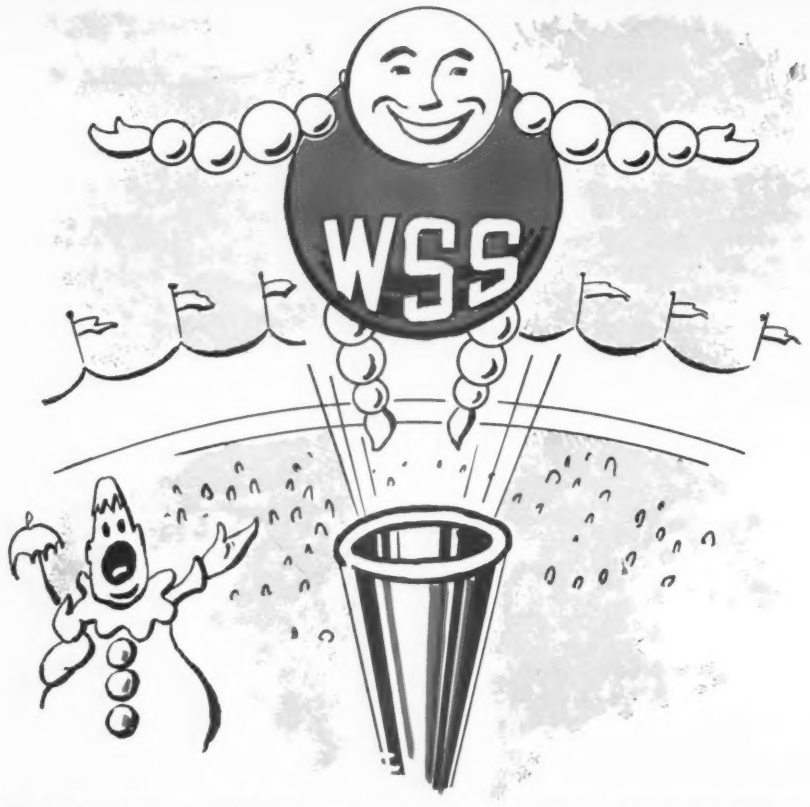

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Performance has been the persuader in switching users to Wheelabrator Steel Shot. More than 1,000 users have changed from other abrasives to Wheelabrator Steel Shot in 2 years strictly on the basis of faster, more thorough and more economical cleaning obtained with this premium steel shot. It is the only shot with all the qualities vital to lowest-cost cleaning and peening. Its high hardness gives super cleaning speed. Its toughness gives extra long life for low maintenance costs. The proof that these qualities are facts, not just claims, is in the growing list of users who have changed to Wheelabrator Steel Shot from other abrasives. Try it today. It's the low-cost answer to your cleaning and peening problems.

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some segments being held to 0.002 in. per in. are claimed for castings up to 3 in. long. Larger castings have dimensional variations ranging up 0.015 in. per in. Many shell molding patterns have been produced at less cost than by conventional methods.

Raymond J. Wilcox, Michigan Standard Alloy Casting Co., Detroit, described work by the physical and nondestructive testing committee on developing test bars for ICI standards.

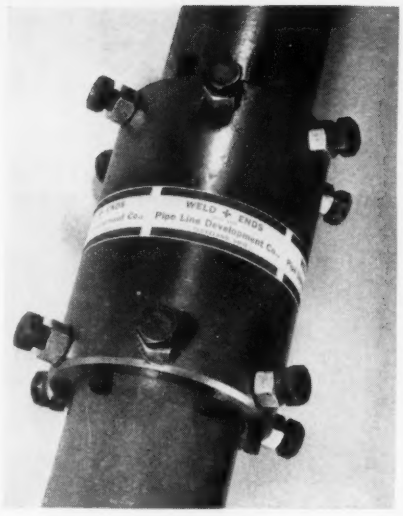
Economics of Vacuum Melting for Investment Casters — F. Kenneth Iverson, Cannon-Muskegon Corp., Muskegon, Mich. Vacuum-melted high-temperature alloys are superior to similar air-melted alloys, and parts investment cast from vacuum alloys have properties better than the wrought part of the same alloy. Preparing alloys for subsequent vacuum melting by first using air-melting equipment with special deoxidizing procedures has the advantage of reducing melting time and producing a more consistent product. Although several types of molds have been poured under vacuum, investment molds apparently are the only ones that can be used without basic revisions for producing vacuum castings of iron, nickel and cobalt-base alloys.

Compared with vacuum techniques, melting and pouring under argon is cheaper but does not produce cast parts with comparable properties. Also, argon melts are more difficult to control. A comparison of costs of producing parts shows that high-alloy parts produced under argon would cost 40.3 per cent more than for air-melted metal. Vacuum melts would cost 47.7 per cent more. For low-alloy material the costs would be greater by 64.4 per cent and 75.3 per cent, respectively.

Investment Casting Gating Clinic —Moderator, Geoffrey W. Paget. Panel members: P. L. Butler, Arwood Precision Casting Co., Brooklyn, N. Y.; W. A. Dubovick, Engineered Precision Casting Co., Matawan, N. J., and Charles Yaker, Misco Precision Casting Co., Whitehall, Mich. Good gating is that which produces a sound casting. It must be functionally satisfactory, produce directional solidification and be easy to remove from the casting.

With the help of large charts showing problem casting designs submitted by institute members, the panelists suggested proper gating methods. General discussion was held on each of the suggestions.

Walter A. Dubovick concluded the



NOW users of SAND TRANSMISSION PIPELINES Cut Replacement Time with Non-Welded Installations of WELD+ENDS with Clamping Screws

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Replacing sand transmission piping lines is quicker, easier with non-welded installations of WELD + ENDS with clamping screws. No threading, no special make-ready is necessary. Cut the pipe—slip the WELD+ENDS on—tighten the clamping screws . . . That's all there is to it.

Non-welded WELD + ENDS are better than flanges, especially where there is frequent replacing of pipe. They can be used over and over again with only the clamping screws requiring replacement.

Where pipeline vibration is severe, clamping screws may be equipped with Nylok lock nuts and Shakeproof washers as shown in the illustration.

Reusable non-welded installations of WELD + ENDS offer continuous savings in down time and repair costs. Write today for further information—also inquire about Plidcowear erosion-resistant pipe. Address Dept. E22

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technical meeting by reporting work of the process materials standards committee.

FEMA Meets at Washington For Annual Spring Meeting

Second annual spring meeting of the Foundry Equipment Manufacturers Association was held in Washington, May 25, with about 40 member-company representatives and government officials attending.

The morning was given over to individual group meetings, followed by a lunch and afternoon session. FEMA President D. E. Davidson, Link-Belt Co., Chicago, presided.

Ewan Clague, commissioner, Bureau of Labor Statistics, U. S. Department of Labor, gave a concise but detailed outline of general business conditions as reflected in recent volume and price trends. He indicated that, despite recent slackness in some directions, gross national product should hold closely to its recent record $400-billion level during the remainder of the year.

Joseph Crosby, deputy director of the Metalworking Equipment Division, Business and Defense Services Administration, explained the aims of this agency and its desire for cooperation with industry. Mr. Crosby, who is on leave as vice president of Lapointe Machine Tool Co., also discussed the government's attempts to build up the so-called executive reserve of business men who would be available for service at Washington in any future emergencies.

Einar Borch, National Metal Abrasive Co. and chairman of the FEMA Statistical Committee, presented some comparisons between trends in foundry equipment sales and nationwide figures for new plant and equipment expenditures.

The meeting was concluded with a discussion of the recent AFS Foundry Show and the making of recommendations for the AFS Exhibits Committee in connection with future shows.

Lists Management Publications

A catalog of publications of the American Management Association recently distributed to members of the group also is available to any other interested executives who request it on their business stationery. The booklet contains a brief description of each publication, its price and an order form. Requests should be sent to the association's Publication Service, 1515 Broadway, New York 36.

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Steeletts bring to industry a new grit with all the advantages of high carbon steel to rewrite the story of GRIT blasting costs. For the first time, hardness has been combined with toughness in a single grit to provide maximum efficiency at the lowest possible cost.

OUTWEAR CHILLED IRON 5 TO 1

For cleaning heat treated work, Steeletts outlasted chilled iron 5 to 1 at Commercial Steel Treating Corporation, Detroit, Michigan. Its hardness and toughness enabled this sharp reduction in abrasive consumption. This longer life is also reflected in greatly decreased blast cleaning machine maintenance.

PACKAGED IN 50-LB. CARTONS

For complete information on Steeletts, send for Bulletin 901-D.

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FOUNDRYGIANT Glass Fabric Belt

"Lasts six times longer than other belts,"

SAYS BIG CALIFORNIA FOUNDRY

This 18" U.S. FoundryGiant conveyor belt carries reclaimed sand under extreme outside heat conditions. So far, it has lasted *six times longer* than any previous belt on this job. Foundry executives expect there's a lot more life still in the belt.

A second U.S. FoundryGiant glass fabric belt carries extremely hot shakeout sand back to the reclaiming system. Both belts are delivering services far beyond what the foundry executives expected of conveyor belts.

The quality and durability built into all products made by "U.S." for the foundry industry lower maintenance and overhead costs. These "U.S." products—along with skilled engineering service—are obtainable at any of the 28 "U.S." District Sales Offices, at selected distributors or write U.S. Rubber, Mechanical Goods Division, Rockefeller Center, New York 20, N. Y.

Mechanical Goods Division

United States Rubber

Obituary

WILLIAM J. MATON SR., 80, foundry superintendent, Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., died May 18. Mr.

WILLIAM J. MATON SR.

Maton retired in 1948, after 58 years with the company. A native of Quebec, he moved to Waterbury when he was 6 years old and entered the employ of Waterbury Farrel at the age of 14 as an office boy. He served as paymaster at 16, purchasing agent at 18, and later was transferred to the foundry. Mr. Maton served as president of the Connecticut Foundrymen's Association from 1932 until 1935.

Fred W. Elya, 65, former northeastern district manager, Norton Co., Worcester, Mass., died May 23. He was abrasive engineer in western Pennsylvania and New York state until 1945, when he became northeastern district manager. Mr. Elya retired last year after 43 years with the company.

C. Leo Williams, 67, executive vice president, Gerber Plumbing Fixtures Corp., Chicago, died Apr. 30, at his home in Kokomo, Ind. He became associated with the company in 1933 and played a leading role in development of its manufacturing facilities.

Frederick J. Heaslip, 68, former director and vice president in charge of purchases and traffic, Fairbanks, Morse & Co., died May 28. Mr. Heaslip retired in 1954.

Carl W. Johnson, 69, senior vice president, Cleveland Graphite Bronze Division of Clevite Corp., Cleveland, died June 5. Mr. Johnson was one of the founders of Cleveland Graphite Bronze Co. in 1919.

Myron C. Davis, 52, sales manager, Crown Pipe & Foundry Inc., Jackson, O., died May 25.

John F. Smith, 55, plant manager, Chevrolet Gray Iron Foundry Division, General Motors Corp., Saginaw, Mich., died May 26. He attended New York University and took various management courses at General Motors Institute. Mr. Smith joined the gray iron foundry in 1922 as a coremaker and became general foreman in 1930. He was appointed superintendent in charge of magnesium in 1942, general foundry superintendent in 1945, and plant manager in 1952. Active in the organization of the Saginaw Valley Chapter of the AFS, Mr. Smith was its chairman in 1946-47.

JOHN F. SMITH

Book Review

Transactions of the American Society for Metals, paper, 1061 pages, 6 x 9 in., published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3.

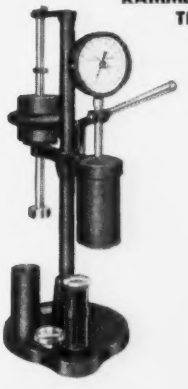
This annual publication of the American Society for Metals for 1956 is Vol. XLVIII, and contains all of the papers and discussions presented at the technical sessions held at the society's annual meeting in October, 1955. The 51 papers presented cover a wide range of subjects relating to investigations on steels, tantalum, molybdenum, titanium, aluminum, zirconium, etc. The book also contains the annual reports of the various officers and other material.

THE Short Cut TO LOW Scrap Losses

When consideration is given to the number of casting defects directly traceable to faulty sand practice, it becomes apparent that proper sand control is the short cut to low scrap losses.

The Gordon-Campbell sand testing units offer the latest improvements for checking these critical properties of sand mixtures: clay content, permeability, bond strength, moisture, core hardness, and core strength. The tests are quick, and no calculations are required. They offer the simplest approach to sand control.

Write for full particulars on Gordon-Campbell sand control units. Savings in scrap losses will pay for the program.



RAMMER-COMPRESSION TESTER—This simple unit combines ramming of specimens for permeability tests and making bond strength tests. Strength values are read on large dial.

PERMTESTER Permeability values for molding and core sand mixtures are shown on dial in a few minutes.

All Gordon-Campbell sand testing units are designed to conform with the recommendations of the Committee on Foundry Sand Research of the American Foundrymen's Society.

FREE TO ANY FOUNDRY MAN

Write for this booklet. It explains foundry sand control and how to reduce scrap losses.

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Circle 654 on Inquiry Card

Around the Country

NEWS REPORTS FROM

Los Angeles . . . Philadelphia . . . Chicago . . . New York . . . Pittsburgh

Philadelphia— Tapering off in June, foundry operations will dip further with the vacation and hot weather season at hand. Various shops will be down for the first two weeks of July for mass vacations. Others will be suspending for the same reason at other times during the summer.

In gray iron, the decline in June was particularly noticeable at plants engaged in light work. Some got down to four days a week and others, while operating five days, were doing so with restricted labor forces. Those engaged in heavy work managed to sustain operations fairly well. Auto die work was off, but heavy equipment specifications remained active. These shops are averaging at least five to six weeks on backlogs. Foundries engaged in light work have little backlog and are competing actively for available business. Pipe shops are at least at normal capacity, although they had built up inventories to better handle summer building requirements.

Steel foundry operations usually pick up later than those for the foundry industry as a whole and are generally the last to taper off. Thus steel casting producers were faced with a better demand in June than the gray iron shops. Actually, they operated at close to 100 per cent of normal and were able to maintain backlogs at eight to nine weeks. While off a little, malleable shop operations also hovered close to normal capacity output, reflecting in particular good demands for pipe fittings, building hardware and railroad equipment components. Most malleable shops have backlogs of seven to eight weeks.

Apart from light metal demands, which stem importantly from the aircraft industry, nonferrous casting business is spotty and definitely lower than it was a month to six weeks ago. There will likely be a seasonal lag until after Labor Day.

Los Angeles— Foundry activity continues at the high level of activity that has marked the industry's operations since early in the year. For most foundrymen, the first half of 1956 will stack up as the best in several years. Melting rates hover near 100 per cent of total capacity for most shops.

Producers of steel castings are enjoying the highest volume of business, and nonferrous shops report that May sales were up 15 per cent over the like period last year. A slow first quarter will keep nonferrous shops from surpassing last year's first half total, although second quarter activity should exceed that of 1955. Aluminum foundries are humming, with aircraft plants continually ordering new designs. Unless relaxation of aircraft activity materializes in the fall, aluminum shops will enjoy one of their best years on record.

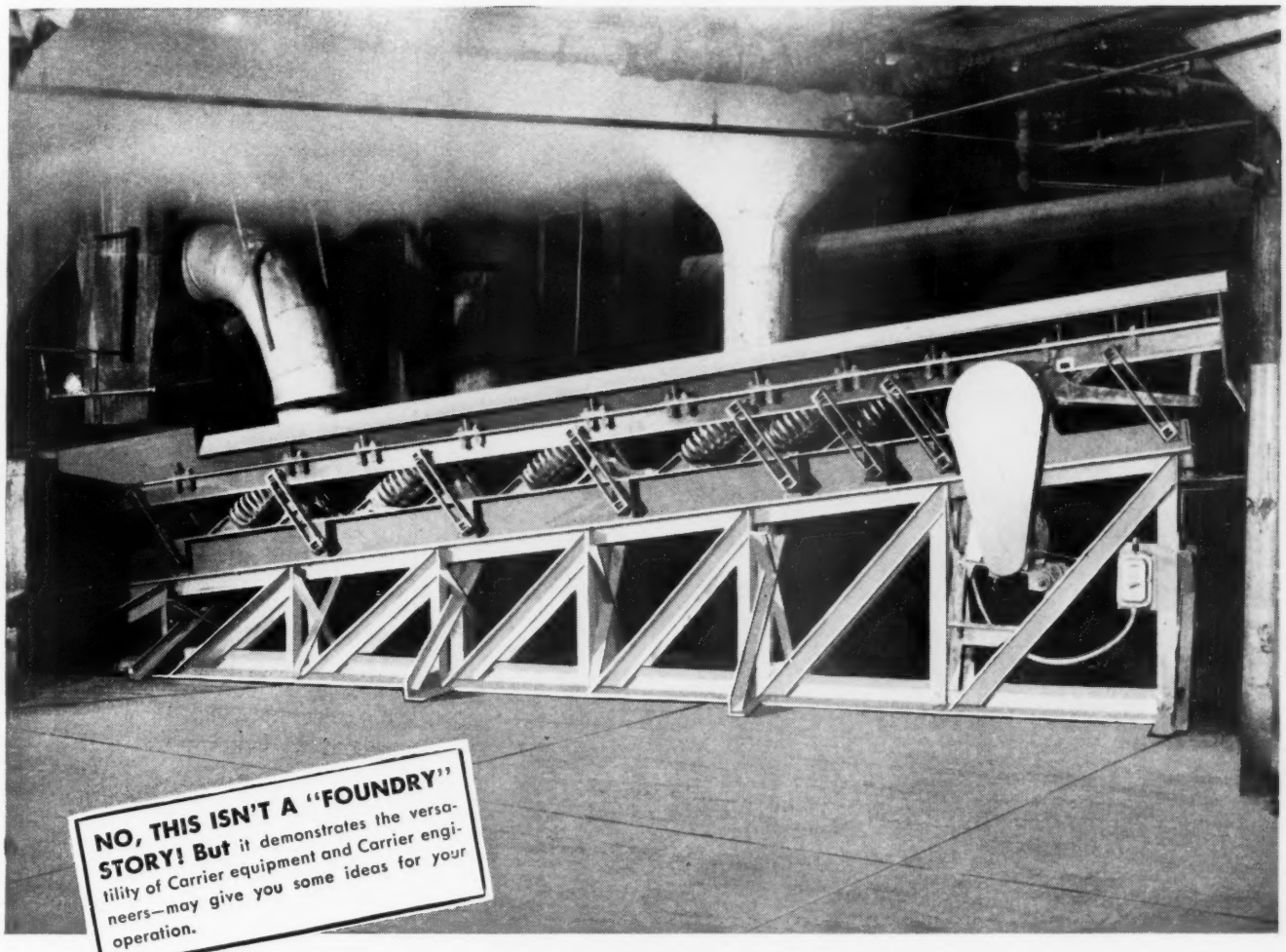
One problem confronting foundrymen is the erratic scrap market in this area. Prices on No. 1 cupola cast are jockeying up and down, with the result that most foundrymen find they are paying from $48 to $50 per gross ton, although the listed price of $46 hasn't been officially adjusted upward for several weeks. In outlying areas, No. 1 cupola cast is selling for as high as $52.

Despite the increasing scrap prices, foundrymen are purchasing No. 1 cupola cast in large quantities, although most purchases are limited to current needs. If collections should fall off, as they often do at this time of the year, a shortage could materialize that would leave foundry scrap inventories depleted. Foundry operators say they have no choice, however, for they cannot build scrap inventories at current prices.

Harvill Corp., one of the largest die casting firms in the West, has acquired 30 acres of land in Santa Ana, 20 miles southeast of Los Angeles, and will construct a 125,000-sq-ft plant expected to increase produc-

REGIONAL MEETING: Northern and Southern California members of the Gray Iron Founders' Society met together recently in Palo Alto, Calif., at a successful regional meeting at which President Charles H. Ker and Executive Vice President Donald H. Workman were present. Members slipped away from the ladies just long enough for this photograph of them to be taken

CARRIER *does the "IMPOSSIBLE" for the biggest names in industry!*


NO, THIS ISN'T A "FOUNDRY" STORY! But it demonstrates the versatility of Carrier equipment and Carrier engineers—may give you some ideas for your operation.

Magic! — broken glass becomes duck soup!

YOU can't see it—but broken and molten glass is being moved to storage on that Carrier Natural-Frequency Conveyor in Corning's Wellsboro Plant. The broken glass (called cullet) used to be collected in metal tote boxes, doused with water, then taken to storage with a fork-lift truck.

Excess man power was involved in the operation—three men were used in non-productive capacities to move the tote boxes. A tremendous amount of water was consumed by the process, and steam from the molten glass and water caused corrosion problems that were not easily dealt with. Steam and water overflow also made large areas of the sub-basement untenable.

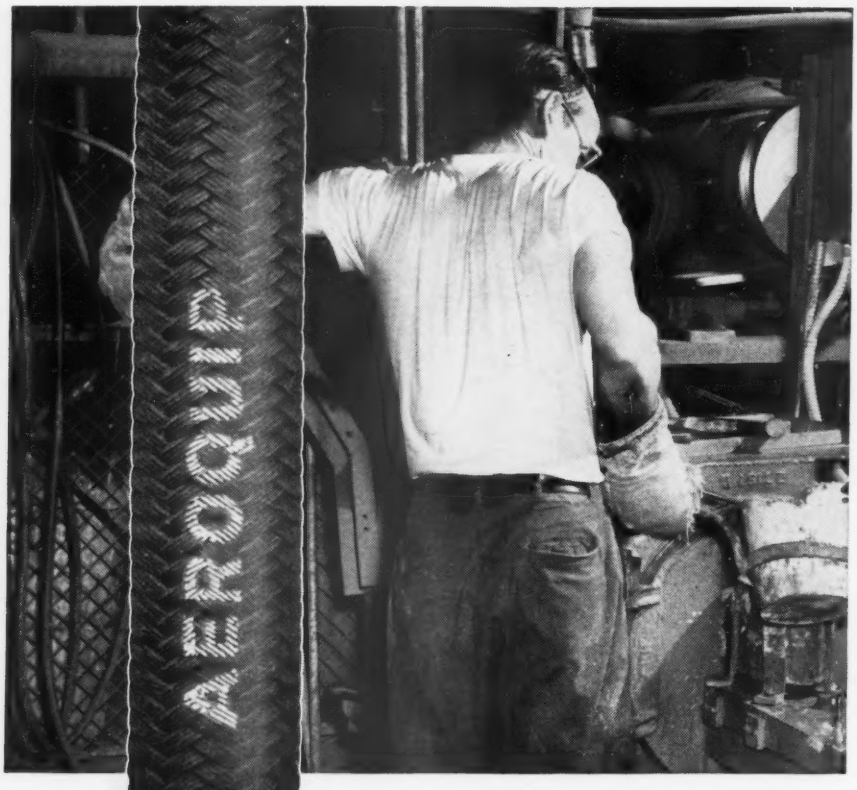
Cleaning up this operation was obviously no job for a boy. But for Carrier engineers it was almost routine. Working with the manufacturer, they soon designed a series of Natural-Frequency Conveyors to take on the whole dirty job, *automatically and continuously!*

The molten and broken glass is now fed directly onto Carrier Conveyors. Pools of water—plus vibration—combine to size, quench, cool and dry the material, *while it is being conveyed.* No man-power, no fork-lift truck, no mess. What's more, the pans are covered so that steam is exhausted outside the plant, and water costs are running $25 less per day!

What's the big headache in your operation? Whether it's as dramatic as this or fairly run-of-the-mill, you'll be smart to check with Carrier—pioneers in the design and manufacture of really *practical* vibrating conveyors and processing equipment. Write direct for full details and a copy of our new general Bulletin 112.

CARRIER
~~NATURAL-FREQUENCY~~
CONVEYORS

Carrier Conveyor Corporation
221 North Jackson Street, Louisville 2, Kentucky



Longer Hose Line Life with Extra-Tough

AEROQUIP 250 psi

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FITTINGS AND HOSE

(Patent Applied For)

LONGER LIFE The Aeroquip combination of 1525 hose plus patented *SOCKETLESS* Fittings are ideal for air, oil and fuel lines. Able to withstand vibration, flexing and abrasion which ordinarily cause early failure, *SOCKETLESS* Fittings and Hose offer longer service.

EASY TO ASSEMBLE Anyone can make a hose line in seconds using *SOCKETLESS* Fittings and Hose. Just cut the hose to the length needed and push on the *SOCKETLESS* Fittings. You have a factory-quality hose line ready to install.

LOW COST With Aeroquip's low-cost *SOCKETLESS* Fittings and Hose, there is no forming and fitting problem. You save on installation cost as well as hose line cost, and *SOCKETLESS* Fittings can be used again and again.

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Circle 656 on Inquiry Card

tion capacity by 70 per cent. Completion is scheduled for January, 1957. This step marks the first attempt of a die casting firm to move from the heavy industrial areas to the suburbs, a move the electronics industry has been following for several years. Santa Ana Chamber of Commerce officials hailed the move, as was to be expected, and some foundrymen are watching the results. Many would like to follow, to escape from the smog snipers in Los Angeles proper.

Pittsburgh— Slowdown in sales to automotive manufacturers did not affect over-all foundry business in this city early in June. Many foundries report lengthy backlogs of orders for mill equipment, an important factor in Pittsburgh's economy.

The business outlook for summer months is less encouraging. Although pig iron and scrap sales were strong in early June, several foundries specializing in filling small orders expect a slack period during July and August. One gray iron foundry reported that half of its customers were planning to close for two weeks in July, a move which would trim its sales by about 15 per cent for July and August.

Captive foundries generally plan to operate near capacity during summer months, but order backlogs of independent foundries average about two months. A slump in demand from principal customers could result in a dull third quarter for local independent firms.

Equipment producers report sales are very strong, with favorable effects continuing from the recent foundrymen's convention.

Chicago— Midwestern foundries which have obtained their coke supplies from the ovens of Peoples Gas, Light & Coke Co., Chicago, have been uneasy over reports the ovens may shut down about July 1.

The company announced late in May that it will begin supplying domestic users of gas in Chicago with 100 per cent natural gas about July 1. At present, the gas supplied is about 90 per cent natural gas and 10 per cent manufactured gas. The proportion of manufactured gas has decreased over the years as more natural gas became available.

Elimination of the need for manufactured gas raises the question as to whether it will be economical to continue operating the ovens. The company has not indicated its intentions, but sellers of the coke have kept foundries informed as to what

might happen as events develop.

The company has three batteries of Koppers ovens, two of which are old. It is understood plans are afoot which may keep the modern battery of 51 ovens built in 1948 at a cost of over $3.5 million operating and turning out coke.

* * *

A month-long strike of 400 patternmakers in about 30 job patternmaking shops in Milwaukee, Waukesha, Racine and Kenosha counties, Wis., ended June 1 when agreement was reached on a new two-year contract which granted a wage increase of 15c per hour immediately and another 10c May 1, 1957. The first boost brings the hourly rate to $3.60 an hour.

The workers are members of the Patternmakers League of North America (AFL-CIO). The shops closed by the strike were those independently operated. Shops of large industries were not affected.

Several foundries in the Peoria, Ill., area and the International Molders and Foundry Workers Union of North America (AFL-CIO) reached agreement recently on a new three-year contract. Molders and coremakers received an immediate wage increase of 17c an hour, and all other foundry workers 15c. In 1957, molders and coremakers will get 10c more and all others 5c. The contract can be reopened in 1958 on wages. A night-shift bonus was granted and Veterans Day is added as a seventh paid holiday.

New York—Gray iron foundry operations are tending downward. July will probably mark the low point, with a number of shops closing for mass vacations during the first two weeks. Some trade leaders estimate June operations at around 70-75 per cent of normal capacity. Where work is being fairly sustained, it is usually of the heavy variety.

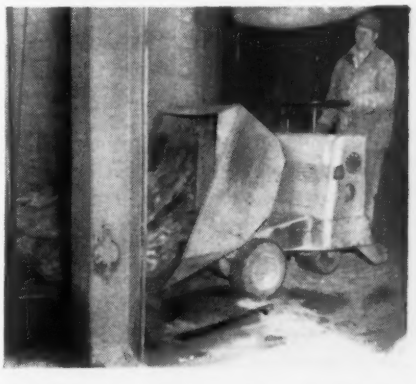
Nonferrous business held up fairly well through most of June but is now reflecting a seasonal lull. In July both casting producers and consumers will be down in various instances for periods of one to two weeks, for vacations, mostly two weeks. This situation should also prevail in a lesser degree in August.

Nonferrous shops engaged in plumbing supplies, valves and meters have been doing very well, and shipyard demands, running counter to the general trend, have been stepping up.

Aside from aircraft needs, commercial requirements for aluminum have dropped seasonally, but not too much.

Low-cost Moto-Bug puts fork lift service within economical reach of small foundries — and has unlimited usefulness as an auxiliary lifting tool in large shops. It handles a lot of light-load work where the cost of operating big, expensive lift trucks is prohibitive. Kwik-Mix S-10 Moto-Bug lifts 1000 pounds to 6-foot height. Forks are 20 or 30 inches long, adjustable 6 to 32 inches wide. There's full power forward and reverse — safe, automatic "deadman" brakes. Turning radius is only 61 inches — overall width 39 inches. *It's yours for only $1490 f.o.b. factory.* But that's not all —

For less than $90 you can add an interchangeable hopper body, or flatbed platform for hauling loads up to 1500 pounds. This gives extra earnings on your original investment — provides 3-tool usefulness for all kinds of material-handling. Larger-capacity R-15 Moto-Bug with multiple attachments is also available at low cost. See your Kwik-Mix distributor today, or send for Moto-Bug® catalog.



mail to: **KWIK-MIX Company, Port Washington, Wis.** *(Koehring Subsidiary)*

Send literature on S-10 Moto-Bug with: ☐ *fork lift* ☐ *hopper* ☐ *platform*

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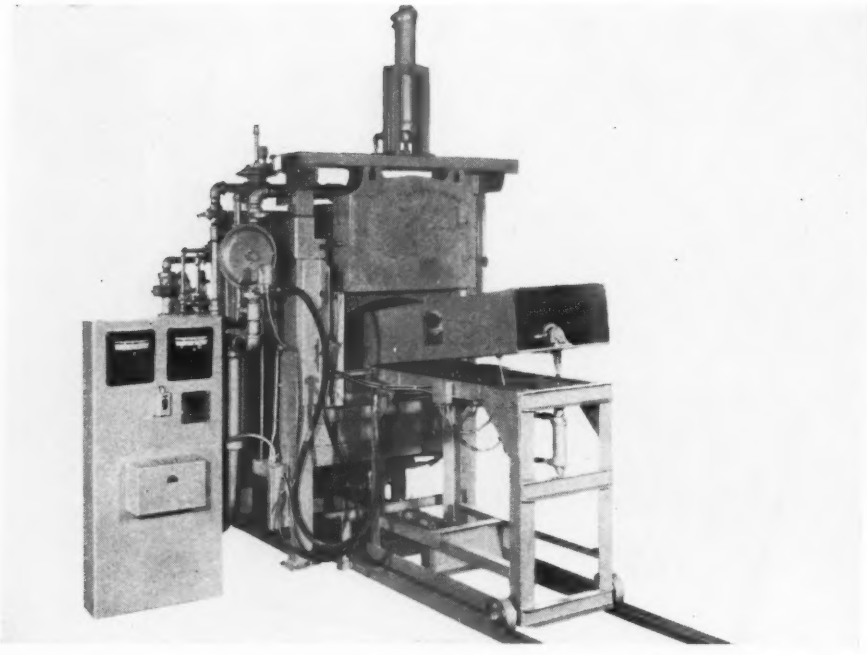
Circle 657 on Inquiry Card

New Equipment and Supplies



Melting Furnace

receives its metal from an automatic loading tray

Eclipse Fuel Engineering Co., 1002 Buchanan St., Rockford, Ill.—Nontilting, aluminum melting furnace has an automatic loading tray which loads metal into the furnace upon actuation of an air valve. Burners fire vertically from the furnace roof. The roof hangs from the furnace frame and does not bear on the side walls. Side walls can be rebricked without disturbing the roof. Operating sequence follows: When start button is pushed, carriage moves to furnace door, door opens, melting burner turns to low fire, loading tray tilts up to sloping hearth, ram gently pushes load onto hearth, ram retracts, door closes and carriage returns for next load. Burner goes back to high fire to melt the new load.

For More Details Circle No. 401—Page 165

Liquid Core Paste

has improved viscosity and nonsettling qualities

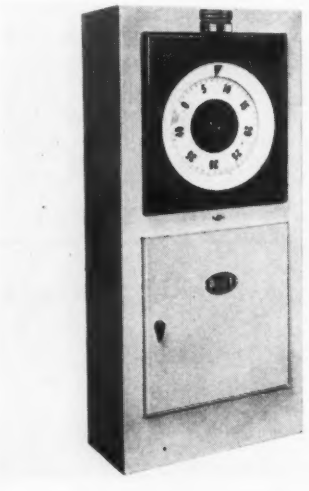
Frederic B. Stevens Inc., Detroit 16, Mich.—Liquid core paste is more viscous and has improved nonsettling qualities over former material. Paste retains its previous high tensile strength, low gas evolution and fast drying properties. Material is said to give excellent results with resin bonded cores and shell molds. It eliminates clamps on shell mold halves. Strength is not reduced at high temperatures.

For More Details Circle No. 402—Page 165

Sand Tempering Unit

for production use does not require a constant batch size

Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich.—Automatic foundry sand tempering unit with moisture and temperature sensing devices is placed in the shell or base of the mixer. Water is added automatically until the moisture level of the sand reaches a preselected value plus enough additional water to allow for evaporation. Claimed advantages of the unit are a constant batch size is not required; desired moisture content can be changed by turning a calibration knob; minimum maintenance is required; no water measuring tank is needed and the rate of water flow is automatically varied in accordance with the amount of water to be added. To prevent overtempering, controls prevent addition of excessive water.

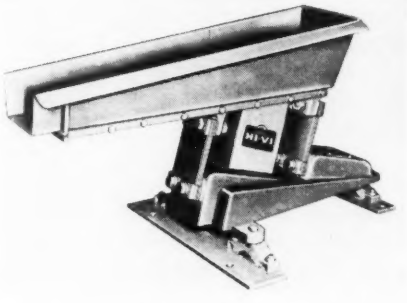


For More Details Circle No. 403—Page 165

Vibratory Feeder

is designed for adaptability to varied handling operations

Eriez Mfg. Co., Erie 6, Pa.—Electro-permanent magnetic vibratory feeder reportedly will feed, mix, dry, cool, spread or convey a wide variety of bulk materials from large pieces down to fine powders. Three models are available according to design to move 2, 4 or 10 tons of dry sand per hour in normal operation. Trays are made in a range of shapes of either 16-gage steel or 16-gage 304 stainless steel, all with welded seams. Units operate directly on 115 or 230-v ac, without a rectifier, and use a magnetic drive that is said to eliminate bearings and friction-producing parts.



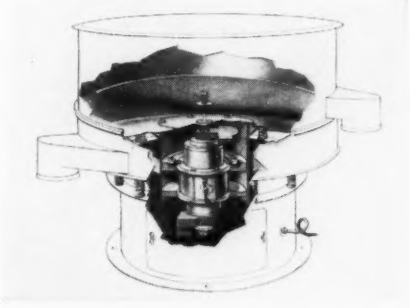
For More Details Circle No. 404—Page 165

Screen Separators

are designed to separate wet or dry screenable material

Southwestern Engineering Co., Separator Division, 4800 Santa Fe Ave., Los Angeles 58, Calif.—Vibrating separator screens provide continuous, clean and accurate separation to any type of screenable mate-

rial. Vibration can be adjusted to fit screening requirements. Speed and turbulence of material travel over a screen cloth can be controlled



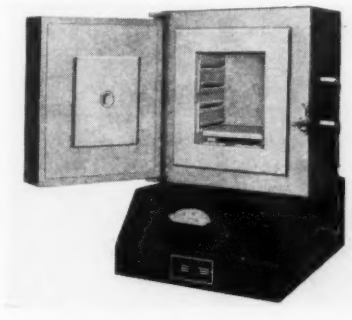
for maximum throughput of material being screened, whether wet or dry. Standard 48-in. models are equipped with a totally enclosed 60 cycle, 3-phase, 1200 rpm, 1 hp or 220/440-v motor. Standard 18-in. models are equipped with a totally enclosed 60 cycle, 1200 rpm, ¼-hp motor, either single phase 115 v, 3-phase 220 v, or 3-phase 440 v. Other voltage and cycle motors available on special order.

For More Details Circle No. 405—Page 165

Laboratory Furnaces

are for laboratory and small heat treating applications

L & L Mfg. Co., 136 Eighth St., Upland 86, Del. Co., Pa.—Small furnaces with temperature ranges from 300 to 2300°F are for laboratory and small heat treating applications. Heat-up time to 2000°F is one hour,



to 2300°F requires an additional one-half hour. Temperature may be held by input controllers at any desired level within the range of the furnace. Controllers may be set from 7 to 100 per cent of input. Zone gradient control is designed into the units by use of multiple circuits each with its own input controller. Gradients are indicated by a pyrometer and two thermocouples located zonewise joined by a thermocouple switch. Models available measure 4½ in. wide x 4½ in. high x 6 in. deep, 6 x 6 x 6 in. or 6 x 6 x 18 in.

For More Details Circle No. 406—Page 165

Aluminum Oxide Cement

is for use in lining indirect arc-type electric furnaces

Electro Refractories & Abrasives Corp., Buffalo, N. Y.—Aluminum oxide cement provides a heat-resistant, long-lasting lining for indirect arc electric furnaces. Aluminum oxide is said to hold up well under high temperatures and slag attack in furnaces melting either ferrous or nonferrous alloys. Linings weigh from 500 to 1000 lb. Material also can be used for patching existing furnace linings.

For More Details Circle No. 407—Page 165

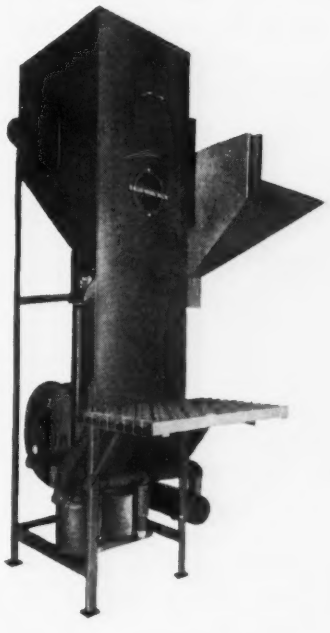
Recuperators

transfer waste heat from furnace gases to incoming air

Griscom-Russell-Schack Co., Pittsburgh, Pa.—Recuperators that have had successful service performance records in Europe for 30 years are now being made available to the American iron and steel industries. Recuperators are a metal shell and tube heat exchanger engineered to transfer waste heat from gases

System Reclaims Core or Molding Sands

DRY SAND RECLAMATION system has been designed to secure a maximum of scrubbing abrasion with a minimum of grain breakage. Basic two-spinner units in the system are rated at from 1000 lb per hr for reuse in cores to 3000 lb per hr for reuse in molds. Two or more of the basic units can be joined in sequence to create four, six or eight spinner units with proportionate increases in capacities. Standard two-spinner unit requires 1000 cfm at 3.0 psi of air. Dust collection equipment requires 2000 cfm.

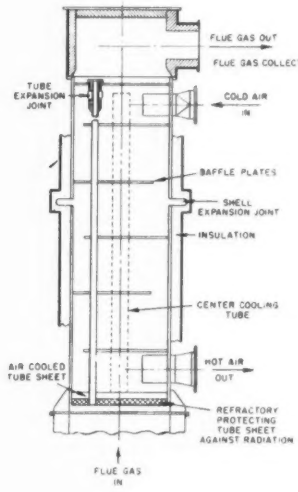


Scrubber entrains sand grains in air streams and repeatedly subjects them to intensive intergranular abrasion. The coatings of spent binders are removed and the undesirable material is exhausted to a suitable dust collection unit. Design makes use of horizontal flow from inlet to discharge to establish low headroom requirements and centrifugal force to provide maximum abrasion with each cycle through successive compartments and spinners.

Grains that do not escape from the unit on any one cycle must remain and continue to recirculate until they do escape. Compartment heights and arrangements are such that the restrictive effect of the gate opening is transmitted backward through all compartment openings to the sand feed inlet. Use of discharge gate setting to determine the number of scrubbing cycles received by the average sand grain permits control and flexibility in producing a product compatible for reuse in either core or molding sand mixtures. The reclamation system is a product of Hydro-Blast, 10265 Franklin Ave., Franklin Park, Ill.

For More Details Circle No. 439—Page 165

emitted by furnaces and soaking pits to incoming combustion air. System reportedly results in considerable fuel saving. Special alloy steel used in the unit make possible air pre-



heats up to 1400°F and gas preheats up to 900°F. Unit is said to provide a temperature transfer efficiency as high as 80 per cent of incoming flue gas temperature. Either horizontal or vertical types are available. Flue gas flow can be arranged in either direction — up or down in vertical units or from right to left or left to right in horizontal units. To increase its adaptability and economy each recuperator is designed and engineered for its specific application.

For More Details Circle No. 408—Page 165

Sand-Bonding Agent

produces precision castings in standard foundry equipment

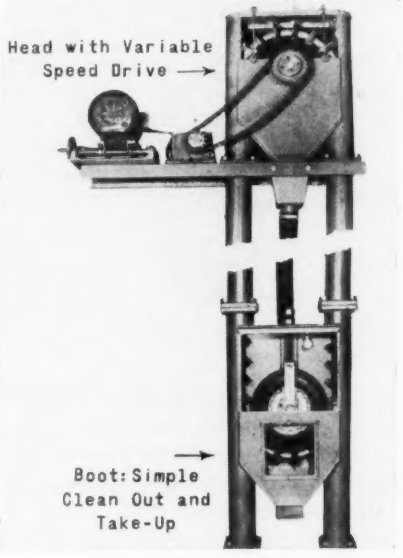
Baroid Division, National Lead Co., P. O. Box 1675, Houston 1, Tex.—Formulated material acts as a sand-bonding agent in the presence of oil and provides a means of bonding sand without the use of water. It permits the use of fine sands with lower permeability than is allowable with water sand molds. When the material is used as a facing, the burned sand readily mixes with the green backing sand. When it is used for the entire mold, it is necessary only to aerate or riddle before reusing. Sand can be used without remulling until the green strength has been reduced sufficiently to cause scabbing. Burn-out of oil and bonding material is minimized by leaving hot castings in the sand until cooled below the flash point of the oil in the mixture.

For More Details Circle No. 409—Page 165

Elevator

is designed for elevating free-flowing materials

Hapman Conveyors Inc., Kalamazoo, Mich.—Conveying mechanism consists of standard steel cable carrying concave stamped or cast metal buckets, uniformly spaced by heavy springs under compression. Unit is



for elevating free-flowing materials and is available with 4, 8 or 12-in. diam tubes and with either center discharge for low speeds of 60 fpm or side discharge for high speed operation up to 250 fpm. Pneumatic rubber-tired drive and the take-up wheels eliminate sprockets. Take-up screw adjusts for cable stretch.

For More Details Circle No. 410—Page 165

Fork Truck

is engineered to handle loads in confined areas

Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, O.—Fork truck of 3000 lb capacity is engineered to handle loads in confined areas as narrow aisles, inside truck trailers and box cars. One model has 3000 lb capacity at 24 in. on a 68-in. high lift and another has the same capacity on an 83-in. lift.

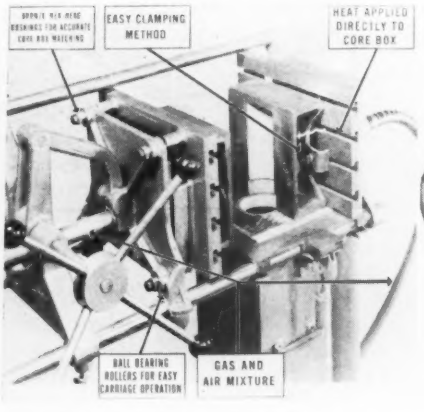
For More Details Circle No. 411—Page 165

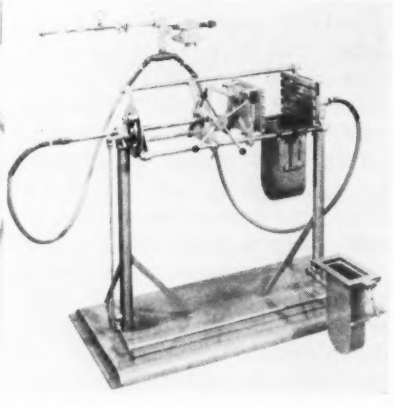
Saw Table Extensions

provide outboard support for stock longer than table

DoAll Co., Des Plaines, Ill.—Table extensions for use with company's contour sawing machines are T-shaped bars that fit into slots in the tables. Bars slide in and out of the table slots independently and are locked into position with an Allen wrench. Studs on ends of the bars serve as stops. Bars are adjusted

Core Machine Is Adaptable to Jobbing Work


EASY CLAMPING METHOD
HEAT APPLIED DIRECTLY TO CORE BOX
BALL BEARING ROLLERS FOR EASY CARRIAGE OPERATION
GAS AND AIR MIXTURE



SHELL CORE MACHINE is said to be ideal for long-run jobs. Because of its quick-change features, it can be fitted into jobbing shops for short-run production. Customers' coreboxes can be used with minimum or no alterations. Heat is applied directly to the back of the box by a gas and air flame.

By having a large and small dump box (box at lower right hand is replaceable with the box on the machine), intricate cores up to 6 in. in diam x 14 in. long can be made at the rate of one per minute or more. Length of investment time determines thickness of core.

All important working parts are machined sand castings. Carriage operates on ball bearing rollers. Bronze hexagon-head bushings match corebox halves accurately. Necessary air and gas controls are supplied with the machine, as are two dump boxes. The unit is manufactured by Dependable Pattern Works, 1634 South East 7th Ave., Portland 14, Oreg.

For More Details Circle No. 440—Page 165

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451. Sodium Silicates

Philadelphia Quartz Co., Public Ledger Bldg., Philadelphia 6, Pa.—Booklet, "PQ Silicates in the Metal Industry," provides general information on uses of silicates for sealing porous castings, metal molding, investment casting, and as binders for refractory cements, coatings and linings for crucibles, furnaces, ladles and molds.

452. Core Box Router

Pattern Machine & Foundry Corp., Third & Schenck Sts., Trenton 10, N. J.—Information sheet illustrates and describes corebox router that will cut up to 10¼-in. diam, any length. The unit reportedly can cut in three dimensions to size any job that can be laid out in two dimensions.

453. Sands

New Jersey Silica Sand Co., Millville, N. J.—Facilities and equipment for mining, preparing and shipping industrial sands are shown in booklet. Some practical sand mixes for gray iron, steel and nonferrous applications are included.

454. Blast Cleaning

Wheelabrator Corp., 1102 South Byrkit St., Mishawaka, Ind.—Mechanical and electrical specifications, dimensions, engineering data, operational features and general information on redesigned airless blast cleaning machine are in catalog 125-D.

455. Chaplets

Angell Nail & Chaplet Co., 4580 East 71st St., Cleveland 5, O.—Price list No. 11 contains price, dimension and general data on line of chaplets, skim gates, core wire and foundry nails.

456. Expendable Pallets

National Wooden Pallet Manufacturers Association, 609 Barr Bldg., Washington 6, D. C.—Technical pamphlet, "What You Should Know About Expendable Pallets," is intended as a guide to pallet purchasers in determining the principles involved in the construction and use of wooden expendable pallets.

457. Core and Mold Coatings

Thiem Products Inc., Milwaukee 14, Wis.—Bulletin 56-2 covers high refractory core and mold coatings, core oils and other sand conditioners formulated for steel and engineered to meet foundry requirements.

458. Strainer Cores

Porcelain Products Inc., Carey, O.—Folder provides standard specifications and general information on ceramic strainer cores for foundry use.

459. Shell Mold Machinery

Beardsley & Piper Division, Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39, Ill.—Bulletin 6000 illustrates and provides gen-

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eral information on company's equipment for processing shell molds. Equipment includes shell mold machines, automatic sand boxes, pattern heaters, shell stripping units, curing furnaces, electrical control stations and sand mullers.

460. Carbon Products

National Carbon Co., Division of Union Carbide & Carbon Corp., Dept. E., 30 East 42nd St., New York 17, N. Y.—Catalog section "Carbon Products for Cupola Furnaces" describes carbon's various cupola applications. Descriptions of well zone linings, breast and tap hole constructions, slag dams and slag and iron trough linings relate the properties of carbon to these refractory problems. A supplemental catalog section on the installation and maintenance of front slagging spouts gives complete procedural details.

461. Heaters

General Electric Co., Schenectady 5, N. Y.—Bulletin GEC-1005G contains application index, calculating data, specifications, operating information and list prices of standard heaters and heating devices. Methods of heating and type of heater recommended for various heating processes are included.

462. Wire Rope

Hazard Wire Rope Division, American Chain & Cable Co., Wilkes Barre, Pa.—Bulletin DH-129D covers more than 120 different types of wire ropes used in industry. Recommendations for various uses cover rope diameters, construction, preforming, lay, grade and core. Charts covering weights and breaking strengths are provided as are photographs and drawings of typical wire rope riggings and accessories.

463. Resin-Coated Sand

Monsanto Chemical Co., Plastics Division, Dept. SW, Springfield, Mass.—Booklet on resin-coated sands for shell molding discusses resins, sands, equipment, coating techniques and the production of blown shell molds and shell cores. A section on trouble shooting shell mold and core production also is included.

464. Industrial Trucks

Lewis-Shepard Products Inc., Watertown, Mass.—Circular 80-203 provides brief descriptions of 42 industrial trucks and attachments. Electric fork trucks, tractors, tiering trucks, stackers, cranes, working height lifters, handlift trucks, floortrucks and trailers are included.

465. Molding Machines

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.—Technical bulletin JSI-4-56 discusses features and presents specifications and dimensions of two 2-station, indexing type, jolt, squeeze, strip molding machines.

466. Nondestructive Testing

Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31, Ill.—Booklet, "Seeing Isn't Always Believing," describes equipment and methods used for nondestructive testing of materials for physical defects.

467. V-Belts

Worthington Corp., Mechanical Power Transmission Sales Dept., Oil City, Pa.—Bulletin V-1400-B20-P describes and illustrates v-belt drives for heavy industrial uses as well as for miscellaneous light machinery drives.

468. High Vacuum Pumps

Kinney Manufacturing Division, New York Air Brake Co., 3529 Washington St., Boston 30, Mass.—Construction features, operating characteristics, specifications and dimensions, speed curves and photographs of small, air-cooled compound high vacuum pumps are in bulletin 403.

469. Noise

Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa.—Booklet in question and answer form is intended to answer a few of the more frequently heard questions regarding the problem of industrial noise and its effect on hearing.

470. Electric Tools

Thor Power Tool Co., Aurora, Ill.—Specifications and general information on company's line of electric tools for use in industrial, maintenance, automotive, trade crafts and related fields are contained in general catalog.

471. Magnetic Parts Separator

Stearns Magnetic Inc., Milwaukee 46, Wis.—Mobile magnetic parts separator for separation of parts from deburring chips, stones, sand or other material is highlighted in bulletin 110.

472. Ethyl Silicate

R. W. Greeff & Co., 10 Rockefeller Plaza, New York 20, N. Y.—Technical booklet on the use of ethyl silicate for precision casting describes

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the hydrolysis, gelation, setting and hardening of the silicate, precoat and investment preparation, typical formulas and solutions of investment casting problems.

473. Shell Mold Process

Plastics Engineering Co., 1607 Geele Ave., Sheboygan, Wis.—Booklet on the shell mold process covers its advantages, equipment and materials in common use, operating cycles, advantages of shell cores and a service guide to aid in solving some of the difficulties encountered with the process.

474. Material Handling

Towmotor Corp., 1226 East 152nd St., Cleveland 10, O.—Spring issue of *Handling Materials Illustrated* documents unusual lift truck applications including a foundry operation that faced a drastic storage and loading problem that was solved by use of lift trucks with high-stacking features.

475. Data Sheet List

National Safety Council, 425 North Michigan Ave., Chicago 11, Ill.—Specific safety facts covering over 220 different subjects are contained in alphabetical list. Data sheets listed provide safety information for industrial applications regardless of the problem.

476. Welding

Tempil Corp., 132 West 22nd St., New York 11, N. Y.—Booklet, "Recommended Practice for the Welding of Steel Castings," is manual published by Steel Founders' Society of America. It covers methods, preparation for welding, effects of welding, combating the effects of welding, the welding operation, electrodes and their classification, and recommended procedures for carbon-steel and low-alloy steel castings.

477. Metallic Abrasives

Cleveland Metal Abrasive Co., 800 East 67th St., Cleveland, O.—Catalog 556 discusses company's laboratory facilities, presents technical data and illustrates the various types of shot and grit produced. SAE specifications are included, as well as a discussion of various cleaning and peening methods.

478. Hearth Furnace

Surface Combustion Corp., Toledo 1, O.—Diagrams, curves and application photographs of hearth furnace with radiant tubes for controlled atmosphere heat treating and quenching of small parts are found in bulletin SC-173.

479. Investment Casting

Investment Casting Co., 60 Brown Ave., Springfield, N. J.—Booklet demonstrates with case histories how investment casting has been used to eliminate machining, tooling and assembly costs while minimizing losses by waste metal.

480. Sanders and Grinders

Max Mfg. Co., 138 Stockton Ave., San Jose 26, Calif.—Folder covers 15 disc sanders and grinders, ranging from 16 to 36 in., together with their accessories and attachments.

481. Ductile Iron

International Nickel Co., 67 Wall St., New York 5, N. Y.—"Heat Treating Ductile Iron" presents graphs and tables summarizing heat treatments and outlines commercial processes for developing in ductile iron castings tensile strength from 60,000 to 150,000 psi and elongation as high as 25 per cent.

482. Ingot Mold Washes

United States Graphite Co., Division of the Wickes Corp., Saginaw, Mich.—Engineering bulletin 15 presents nine reasons why it is advantageous to use the company's ingot mold washes.

483. Bulk Conveyors

Jervis B. Webb Co., Dept. NLP, 8951 Alpine Ave., Detroit 4, Mich.—Engineering data and in-use installation information on bulk handling conveyor systems is provided in bulletin 455.

484. Dual-Fuel Burners

North American Mfg. Co., 4455 East 71st St., Cleveland 5, O.—Bulletin 214 and Sheet DF-214 describe a

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series of dual-fuel burners with capacity of 4,850,000 Btu per hr at 16 psi air pressure. Burner capacities, dimensions, operating information and prices are included.

485. Grinding Wheels

DoAll Co., Des Plaines, Ill.—Catalog section covers line of surface grinding and bench grinder wheels. Composition and applications of fundamental types of wheels are described. Data explaining the meaning of grinding wheel code numbers is included.

486. Sensing Devices

Richardson Scale Co., Clifton, N. J. —Automatic sensing devices that can indicate a lack of material supply or flow in a handling operation are described in technical reference 55D. Three models are shown. Operation and installation of each device is described.

487. Copper Casting Alloys

Beryllium Corp., Reading, Pa.—Catalog covers range of beryllium copper casting alloys. Available alloys, properties, advantages, casting and processing techniques are each presented in a separate section.

488. Safety Hats

Fibre-Metal Products Co., Chester, Pa.—Bulletin 45 describes safety hats and caps made of molded thermosetting, fiberglas - reinforced, polyester resin.

489. Industrial Fans

Robbins & Myers Inc., Propellair Division, Springfield, O.—Complete information on construction features, applications and requirements for use of belt-driven tubeaxial fans in sizes from 16 to 36 in. with air delivery ratings to 26,000 cfm is found in bulletin 620.

490. Chromium and Manganese

Electro Metallurgical Co., Division of Union Carbide & Carbon Co., 30 East 42nd St., New York 17, N. Y.—Folder describes properties and uses of high-purity electrolytic chromium and manganese with additional information on both ferrous and nonferrous applications.

491. Walkie Truck

Raymond Corp., 65-140 Madison Ave., Greene, N. Y.—Bulletin 910 describes and illustrates a walkie truck of 4000 lb capacity that is powered by four conventional automotive type batteries connected in series to provide 24 v operation.

492. Dehumidifier-Filter

Van Products Co., Erie, Pa.—Folder ID-1255NE25 covers general specifications, operation and application information on dehumidifier-filters for control of moisture in compressed air.

493. Dispersions

Acheson Colloids Co., Division of Acheson Industries Inc., Port Huron, Mich.—Fifth revision of booklet lists 41 colloidal and semicolloidal dispersions for the foundry, metalworking and related industries.

494. Cylinder Mountings

Hanna Engineering Works, 1765 North Elston Ave., Chicago 22, Ill.—Advantages, applications, dimensions and general information on universal cylinder mountings designed to eliminate problems due to misalignment between cylinders and loads are in bulletin 76.

495. Circuit Restorer

Peerless Electric Co., Electronics Division, West Market St., Warren, O.—Catalog R-26 describes thermocouple circuit restorer for renewing proper electrical conductivity through thermocouples and thermocouple circuits used in heat treating, melting and other processing operations.

496. Bayonet Saw

Porter-Cable Machine Co., 75 Exchange St., Syracuse 8, N. Y.—Manual for craftsmen involved in cutting or shaping of wood, metal or plastic describes company's portable jig saw which features orbital blade action.

497. Testing Machines

Riehle Testing Machines, Division of American Machine & Metals Inc., East Moline, Ill.—Bulletin RG-14-55 briefly describes company's line of physical testing machines and instruments. Detailed bulletins on all the equipment are available.

498. Electrical Equipment

Industrial Crane & Hoist Corp., 1536 South Paulina St., Chicago 8, Ill.—Bulletin E-156 describes electrical equipment for cranes and monorail systems, including copper wire, bar, T-bar and enclosed conductors.

499. Slotted Angle

Acme Steel Co., 2840 Archer Ave., Chicago 8, Ill.--Idea booklet presents scores of suggestions on using slotted angle for a variety of plant maintenance and equipment needs.

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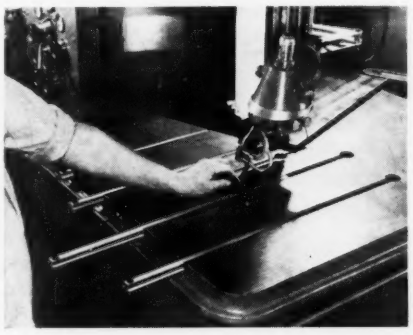
easily to provide outboard support for stock longer than the capacity of the table. Unload and load time is said to be negligible as clamps and



hold-downs are not required. Perpendicular cutting force of the saw band holds the work on the table.

For More Details Circle No. 412—Page 165

Polishing Wheels

are made of coated abrasive cloth bonded with resin

Minnesota Mining & Mfg. Co., Dept. F6-99, 900 Fauquier St., St. Paul 6, Minn.—Small wheels, designed for polishing metal with portable hand tools, are composed of die

cut pieces of coated abrasive cloth bonded with resin and locked into a hub. They are intended for rust or dirt removal, weld polishing, polishing contoured surfaces in metal patterns and die castings and similar polishing operations. They are available in 6 to 10-in. diams with 1, 1½, 2 and 3-in. face widths and in an 11-in. diam in 2, 2½ and 3-in. face widths. Cutting material is aluminum oxide or silicon carbide in grits 50 through 320.

For More Details Circle No. 413—Page 165

Acoustical Rooms

are portable for movement to various in-plant locations

Burgess - Manning Co., Architectural Products Division, 5970 Northwest Highway, Chicago 31, Ill.—Two models of steel rooms for industrial hearing tests are demountable for movement to different locations. One room is 48 in. wide x 78 in. deep x 82 in. high and is designed to provide protection from noise to permit testing of employees' hearing without interference, regardless of the external noise. The other model has the same characteristics but is slightly smaller.

For More Details Circle No. 414—Page 165

Bayonet Saw

gets maximum performance from orbital action of its blade

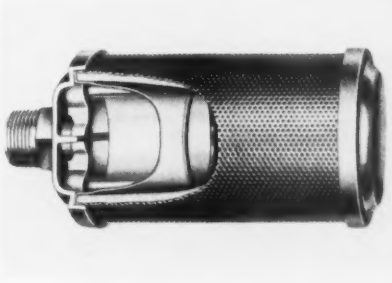
Porter-Cable Machine Co., 66 Exchange St., Syracuse, N. Y.—Bayonet saw achieves high performance results from orbital action of its blade in which the blade teeth are in contact only on the up or cutting stroke and back away on the release stroke. Saw is for use in cutting ferrous and nonferrous metals, plastics and plywoods. Saw has a full 2-in. capacity in wood, ¾-in. in aluminum and ¼-in. in steel. Motor idles at 4500 strokes per minute and cuts at 4250 strokes per minute. It is 6¼-in. high and weighs 6 lb.

For More Details Circle No. 415—Page 165

Air Exhaust Muffler

features a 4-port deflector to improve noise cancellation

Allied Witan Co., P. O. Box 2770, Dept. Q-16, Cleveland, O.—Pneumatic muffler for use on air-operated equipment features a four-port deflector that combines with an internal acoustical resonator to give uniform air dispersement resulting in improved noise cancellation and air



flow. Installation is made with a wrench. Double lock-tight construction resists vibration and holds fast under severe jolting. Muffler is available in sizes from ⅛ to 2 in. N.P.T.

For More Details Circle No. 416—Page 165

Bin Vibrator

is for lightweight applications on bins and hoppers

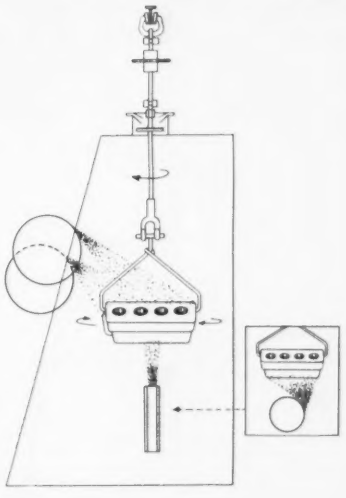
Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13, O.—Small bin vibrator for lightweight applications weighs 25 lb and is designed for use on hoppers, bins, chutes, packers and other bulk material handling equipment. Unit is electrically operated and is available in all common volt-

Unit Exposes Pieces to Entire Cleaning Cycle

MONORAIL BLAST cleaner is designed to handle cleaning of parts with internal cavities, such as automobile engine blocks. The unit places the work to be cleaned in such a position that cavities are exposed to the abrasive shower from a single hurling wheel during the entire period the piece is in blasting position. This technique differs from conventional designs that have permitted critical areas to be subject to the blast from a single wheel only about one-fourth of the time.

The crankcase cavity in the accompanying illustration is being blasted from one wheel during the block's entire rotation. The valve section and the sides of the block are exposed to two hurling wheels in the cabinet sidewalls.

Other design developments are double chain drives to increase rigidity of the work-holding hooks on the conveyor to reduce the swaying of work in the blasting compartment that results from



the force of the blast. Another innovation is the use of newly designed traveling seals for prevention of abrasive leakage around the monorail conveyor mechanism. The cleaning unit is manufactured by Wheelabrator Corp., 505 South Byrkit St., Mishawaka, Ind.

For More Details Circle No. 441—Page 165

ages, alternating current only. It draws 100 w, delivers a 275-lb impact and comes with mounting plates for either portable or permanent installation.

For More Details Circle No. 417—Page 165

Clamshell Buckets

increase number of models available in company's line

Erie Strayer Co., Bucket Division, Erie, Pa. — Two clamshell buckets have been added to company's line. Units are a light rehandler of 3/8 to 4-yd capacity and extra heavy duty hard diggers of 3/8 to 2-yd capacity. Through use of an equalizer bar arrangement, the entire line can be adapted to 3 or 4-line application.

For More Details Circle No. 418—Page 165

Hammers

have a tubular head loaded with grit to absorb bounce

Tahlen Hammer Co., 1729 First Ave., South, Seattle 4, Wash.—Soft-faced and metal-faced hammers and tappers feature a tubular head loaded with steel grit which causes the hammer to "follow through" the stroke instead of bouncing. Soft-faced hammers range from 6 oz to 3 lb with choice of Tenite or nylon tips. Metal-faced hammers range in size from 10 oz to 3 lb. Soft-faced tappers are made in 5 and 8 in. lengths. Hammers and tappers have application in production and assembly operations.

For More Details Circle No. 419—Page 165

Sand Ramming Cups

reportedly have long life and reduce machine downtime

Latrobe Steel Co., Special Products Division, Latrobe, Pa.—Cup liners for use on centrifugal type sand ramming machines are made of high carbon, high chromium, high vanadium die steels. Cups are made to insure proper fit next to the liner and are supplied in two sizes, one to fit 4 x 16, 4 x 19 and 4 x 22-in. heads and the other to fit 5 x 19 and 5 x 22-in. heads. Reported exceptional resistance to abrasion is said to effect savings in machine downtime.

For More Details Circle No. 420—Page 165

Axial Flow Fans

feature wide blades designed to minimize operating noise

Detroit Blower Corp., 9867 Pacific Ave., Franklin Park, Ill.—Axial flow fans feature wide blades which offer high pressure characteristics with reduced operating noise. Belt-driven and direct-motor powered models are available. Cradle-slung floor units, extended shaft models, adjustable-height floor stand fans and large in-

EC&M MAGNETS HANDLE CASTINGS . . .

HOT FROM THE SHAKE-OUT TABLE

Production picks up when EC&M ALL-WELDED Lifting Magnets are on the job . . . in charging tumbling barrels . . . removing risers from sand . . . making up cupola charges . . . for sweeping clean incoming cars of pig iron or scrap. EC&M Magnets are ALL-WELDED . . . magnetic circuit is efficient . . . pole shoes keep tight . . . coil space is of better proportion.

Get the facts on EC&M ALL-WELDED Magnets. Write for Bulletin 900-F showing 15 circular sizes, and quick-discharge controllers.

6749

Square D Company—Electric Controller & Mfg., Division

4498 Lee Road • Cleveland 28, Ohio

Circle 658 on Inquiry Card

LET'S LOOK at

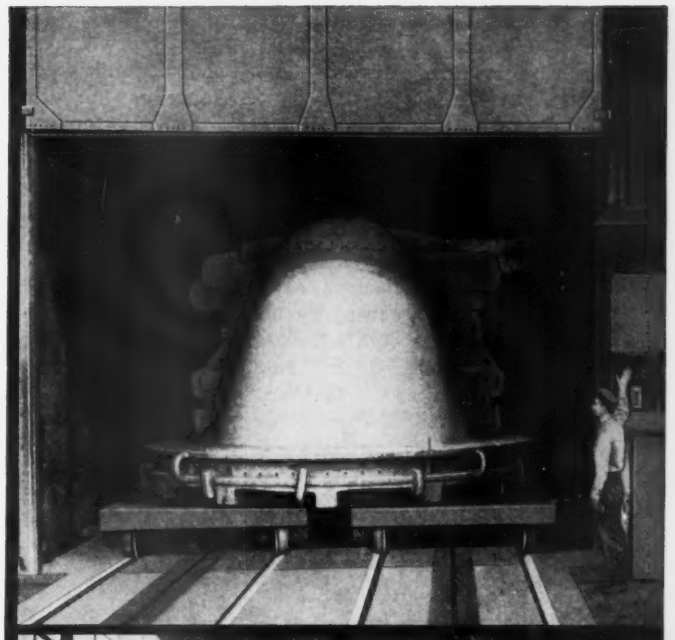
OVENS for every baking requirement

OVENS that will be faster and less expensive to operate

OVENS that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

Write for Bulletin 53-CM



TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

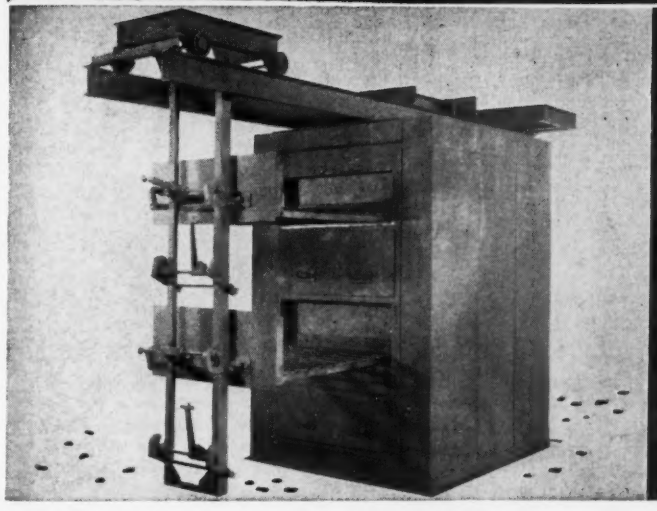
BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'0" deep x 45'-0" high.

BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.

THE **carl mayer** CORP.

3030 EUCLID AVENUE CLEVELAND 15, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories



dustrial models make up the line. Fan diameters are from 12 to 72 in. and have an air moving capacity of 1200 to 100,000 cfm.

For More Details Circle No. 421—Page 165

Gear Spray Lubricant

in aerosol spray containers has high adhesive qualities

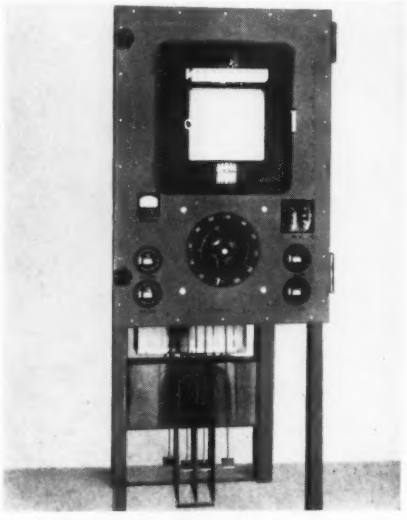
Rothlan Corp., 3618 Laclede Ave., St. Louis, Mo.—Open gear spray lubricant said to possess high adhesive qualities comes packaged in 12-oz aerosol spray containers. Material reportedly eliminates dripping or throw off, saves application time and assures lubrication by reaching hard-to-get-at gears. One can covers about 25 sq ft.

For More Details Circle No. 422—Page 165

Creep Testing Machine

can hold four specimens under loads up to 4000 lb

Baldwin - Lima - Hamilton Corp., Philadelphia 42, Pa.—Multiple creep rupture testing machine of the lever type can hold four specimens simultaneously under loads up to 4000 lb. Compound lever system gives a ratio of 50:1. Specimens can be loaded in increments of 5 lb. Machine contains a dashpot in each of the lever systems which prevents transmitting shock and recoil from a breaking specimen to other specimens under test. A four-specimen electric furnace under automatic temperature control will hold specimens at any temperature up to 1800°F. Extensometers can be used on specimens if desired. Test bar grips have ¾-in. diam heads, ½-in. diam shanks and ⅜-in. internal threads.



For More Details Circle No. 423—Page 165

Surgical Dressing

of nonwoven cotton will not stick to wounds or burns

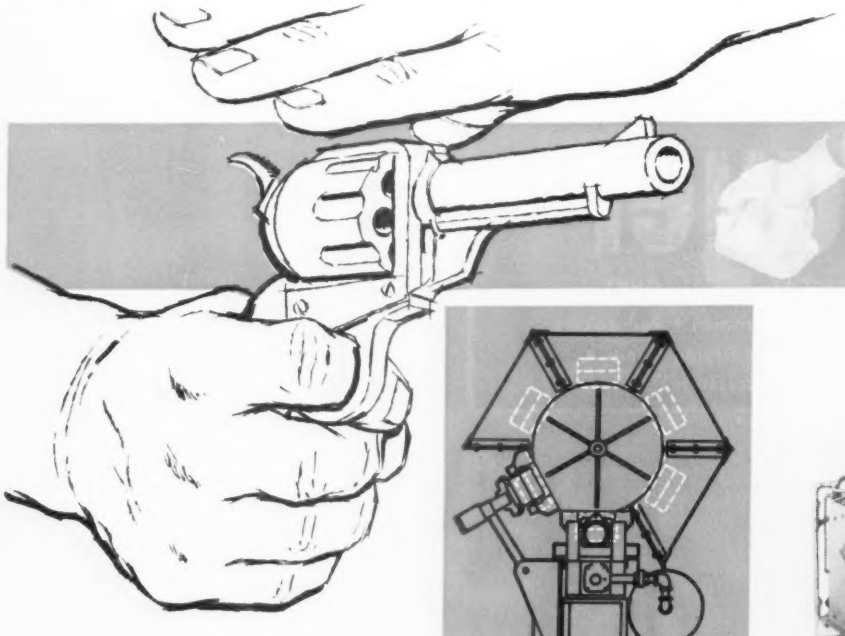
Davis Emergency Equipment Co., 47 Halleck St., Newark 4, N. J.—Absorbent surgical dressings are made of nonwoven cotton material with a thin coating of perforated plastic bonded to it. Discharge from the wound passes through the perforations and is absorbed by the material. Discharge cannot flow back into the wound as the perforations act as "one-way valves." Dressings reportedly can be removed without soaking, without pain and without rupturing the healed surfaces. An 8 x 10 in. compress as well as 2 and 4 in. compresses are available.

For More Details Circle No. 424—Page 165

Rust Remover

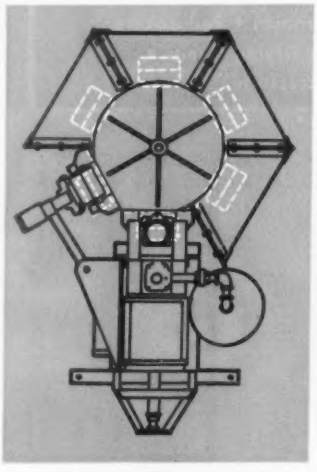
is compounded for simplified one-dip and rinse operation

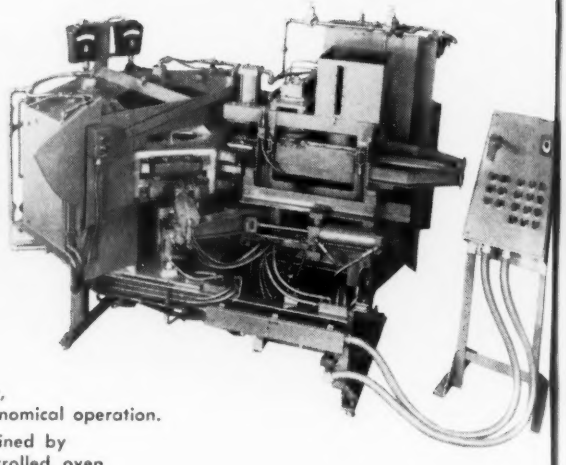
Turco Products Inc., 6135 South Central Ave., Los Angeles 1, Calif.—Alkaline material removes rust, paint and primer in a dip and rinse operation. Powdered alkaline material contains no cyanide compounds, requires no electrolytic equipment, emits no corrosive fumes, does not



Now...

Rapid-fire





Resembling the chamber of a six-shooter, the new SPO rotary assures fast and economical operation.

Accurate curing temperatures are maintained by automatic two-stage thermostatically-controlled oven and insulated oven sealing doors.

affect dimensional tolerances or cause hydrogen embrittlement. It requires no after neutralization, just a pressure rinse.

For More Details Circle No. 425—Page 165

Steel Type

is supplied in a variety of styles and sizes

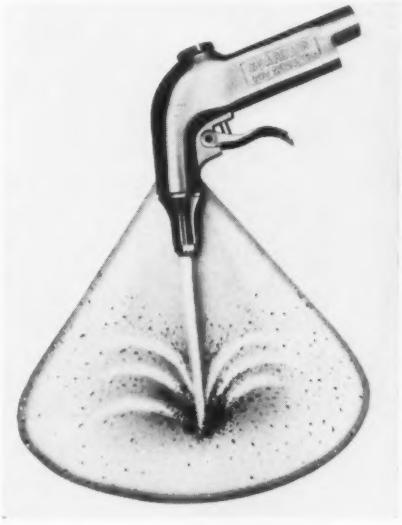
Pryor Steel Stamps, 216 West Jackson Blvd., Chicago 6, Ill.—Interchangeable steel type is available in a variety of styles to fit popular types of presses and marking machines as well as for hand use. Type is made of tool steel and each character is hand finished, hardened, Rockwell tested, anodic etched and plated. Seven sizes are supplied, 1/32, 1/16, 3/32, ⅛, 3/16, ¼ and ⅜-in.

For More Details Circle No. 426—Page 165

Safety Air Gun

protects operator's face from flying chips, dust or debris

Hydraulic Mfg. Co., Kiel, Wis.—Safety air gun may be used in any application where air pressure is used for blowing work clean. Gun is attached to air line and operated by a grip trigger. Gun is engineered to protect the operator's eyes, ears and face from flying chips of metal, dust or other debris, which are blown from the area to be cleaned by a central air jet shot from the nozzle.



A second jet of air in the shape of a cone is blown from the gun simultaneously to provide a protective shield or umbrella of high pressure which prevents debris from flying upward.

For More Details Circle No. 427—Page 165

Vibrating Screen

features an atomized oil lubricating technique

Hewitt - Robins Inc., Stamford, Conn.—Vibrating screen has a speed of 3300 rpm when set for a 1/32-in. stroke and 2400 rpm when operating on a 1/16-in. stroke. Design includes a lubricating technique in which atomized oil is injected under pressure into bearings in the form of a fine airborne mist. Screen is designed for use with screen cloth of 10 to 80 openings per lineal inch. Screen requires minimum headroom and handles most materials at an inclination of 10 to 15 degrees from the horizontal.

For More Details Circle No. 428—Page 165

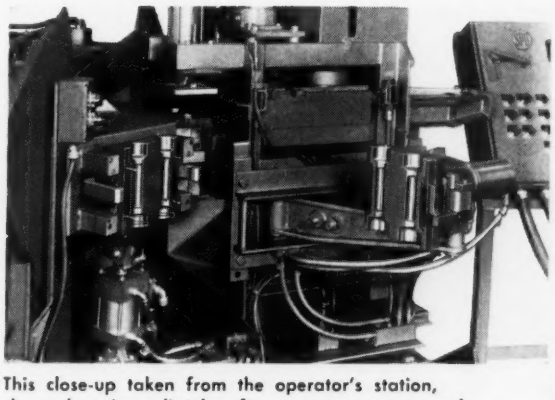
Temperature Indicators

have calibrated melting points ranging from 113 to 2000°F

Tempil Corp., 132 West 22nd St., New York 11, N. Y.—Sixty-two different temperature indicating liquids of calibrated melting points ranging from 113° to 2000°F can be applied by daubing, brushing, dipping or spraying. Liquids are for general heat treating or heat processing applications, particularly on areas not readily accessible for company's tem-

PRODUCTION OF HOLLOW CORES

WITH THE NEW SPO ROTARY holo-core



This close-up taken from the operator's station, shows box immediately after cores were removed. While this operation is being performed, the blow head is filling the box just emptied. Four boxes containing blown cores are in curing oven.

Developed especially to meet the needs of mass-production foundries, this new model SC-10-R rotary holo-core machine accommodates six core boxes up to 10" x 12" x 6". COMPLETE CYCLE TIME IS 15 SECONDS OR LESS . . . and all operations, except removal of finished cores from boxes, are automatic and controlled by precision valves and electrical sequence timers.

Cores produced are extremely clean and accurate . . . distortion-free . . . easy to handle . . . ready to use.

WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES

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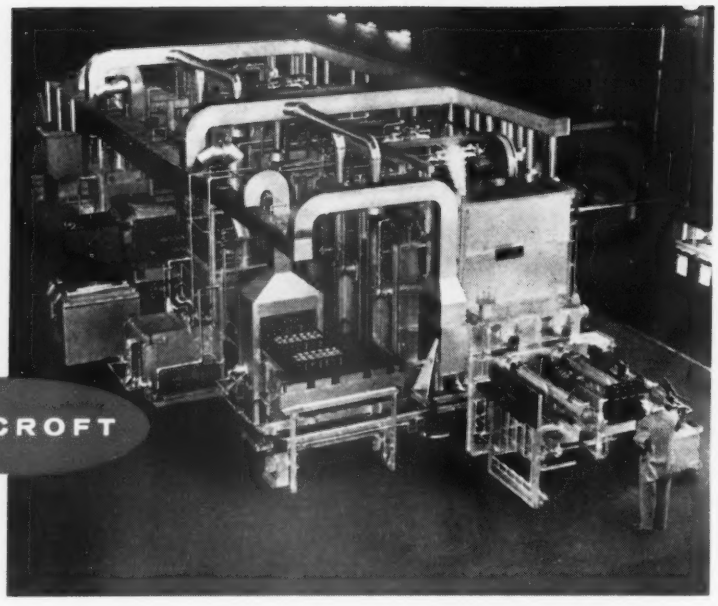
Cleveland 25, Ohio

6931-S1

BLAZING THE HEAT TREAT TRAIL— WITH HOLCROFT



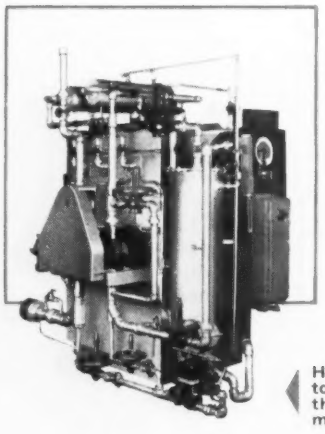
LET'S TALK

CONTROLLED ATMOSPHERES

Holcroft has pegged many of its research activities to the problems of controlled atmosphere heat treating. As a result, Holcroft has blazed the trail for industry.

Controlled atmospheres protect the stock while it is being treated and help produce the desired finish to the parts. Scale and decarburization are eliminated. Stock in the furnace chamber is surrounded by a gas atmosphere which excludes all air and products of combustion.

Basic gas generator patents go back to 1883. However, the first real use and understanding of fundamental equilibrium constants—now in general use in all gas atmosphere work—was by Holcroft in 1934. Dew point cups and equilibrium curves were furnished customers at that time. Today, Holcroft's new Lo-Dew generator (750, 1200 and 2400 cfh) provides *rated capacities* at low dew points.



Holcroft's new gas generator designed to produce gas atmospheres between the limits of perfect combustion and modified "302".

Advances like these are typical of the scope of Holcroft activities—proof that you can get right answers without prejudice. Insist upon a Holcroft quotation as your first step when you have a heat treat problem. *You'll save!*

HOLCROFT AND COMPANY

BUILT BY HOLCROFT & COMPANY DETROIT, MICH.

6545 EPWORTH BOULEVARD • DETROIT 10, MICHIGAN

PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • DARIEN, CONN. • HOUSTON, TEXAS • LOS ANGELES, CALIF. • PHILADELPHIA, PA.
CANADA: Walker Metal Products, Ltd., Windsor, Ontario

Circle 661 on Inquiry Card

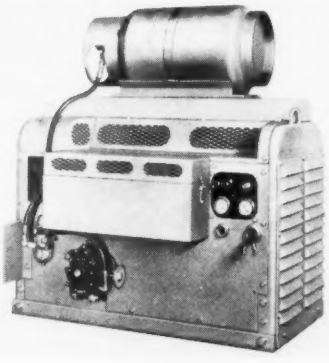
perature indicating sticks or pellets. When applied the liquid dries almost instantly to a dull mark. When the stated temperature is reached, this mark liquefies sharply. On cooling it resolidifies with a glossy or vitreous appearance distinctively different from the original mark.

For More Details Circle No. 429—Page 165

LP Gas Power Unit

is for use on "sit down" type electric trucks

Ready-Power Co., 3826 Grand River Ave., Detroit 8, Mich.—Liquefied petroleum gas-electric power



unit is for use on 2000 to 5000-lb "sit down" type electric trucks. A mounting on top accepts 33½ or 43½-lb standard LP gas tanks or ASME type tanks. Hinged cover and side plate allow access to engine accessories without removing fuel tank. Access to generator and instrument panel is through a removable end plate.

For More Details Circle No. 430—Page 165

Material Handling Truck

of 1¼ ton capacity has torque converter drive

Prime-Mover Co., Muscatine, Iowa —Material handling truck of 1¼-ton capacity features a torque converter drive. Unit has a top speed of 12

mph with special gear ratios available for higher speeds. Power plant is a 15-hp, air-cooled engine. Engine and transmission are coupled to the differential with an automotive type drive shaft. Standard beds include an 18-cu-ft bulk handling bed and a

for lower maintenance
it's ohio magnets

Ohio Magnets cost less to maintain because they're built with an extra margin of safety. So for extra magnet life, extra magnet value—always specify Ohio Magnets and Ohio Magnet Controllers. There's a type and size for every lifting job. Send for free copy of Bulletin 112, or consult the Yellow Pages for Ohio offices in principal cities. AA-1476

THE OHIO ELECTRIC MFG. CO.
5400 DUNHAM ROAD • MAPLE HEIGHTS
CLEVELAND, OHIO

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President

Ohio Also Makes Separation Magnets • Nail Making Machines • Fractional Horsepower, Shell and Torque Motors

Circle 662 on Inquiry Card

This Simplified Design Will Cut YOUR PIG CASTING COSTS!

Bailey

PIG CASTING MACHINES

Drastically reduced maintenance costs result from the Bailey "stationary wheel" design, which eliminates 80% of the moving parts of ordinary pig casting machines. In this design roller bearing idler wheels are mounted on the frame rather than on t! e moulds, thus keeping them far as possible away from hot metal.

These machines are used in the casting of ferrous and non-ferrous pigs and ingots.

WILLIAM M. Bailey COMPANY
ENGINEERS
LEADERSHIP THROUGH QUALITY
1221 BANKSVILLE ROAD PITTSBURGH 16, PA.

Circle 663 on Inquiry Card

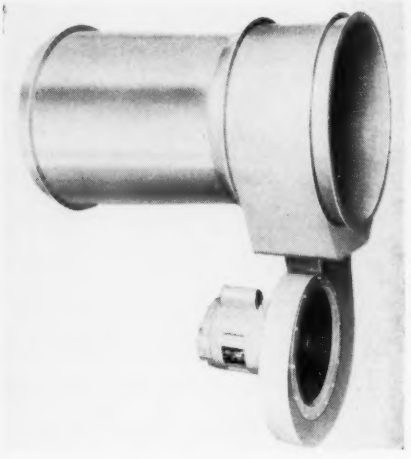
42 x 42-in. flatbed. Bulk handling bed has a sliding endgate, swinging tailgate and dumping controls to accommodate any rate of load discharge.

For More Details Circle No. 431—Page 165

Power Exhausters

are for industrial venting and heating applications

Quickdraft Co., Dueber-Hampden Bldg., P. O. Box 87, Canton 1, O.—Standard and heavy duty power exhausters are for handling industrial venting applications and commercial heating plants without exposing fan



blades and motors to exhaust gases. Mounted outside the exhaust units, fans and motors run in clean room air or in ducts that supply clean outside air. No special stacks are required and where codes permit the units can exhaust through building walls or roofs. Units are built in eight sizes for vent diameters of 12, 14, 16, 18, 20, 22, 24 and 30 in. For exhausting direct to atmosphere or into standard stacks or chimneys, capacities range from 141,600 to 877,000 cu ft per hr. Special exhausters can be made to handle larger capacities.

For More Details Circle No. 432—Page 165

Battery Charger

is especially designed for rider type lift trucks

K-W Battery Co., 3676 West Howard St., Skokie, Ill.—Battery power unit has a permanently mounted charger, permitting rider or walkie type lift trucks to be given a power boost whenever the truck is not in operation. Batteries can be charged by plugging the charger into any 110 or 220 v, 60-cycle outlet. Charger can be left "on" without damage to the battery. As the charger is permanently connected to the terminals, it is not necessary to disconnect bat-

8 REASONS WHY...

leading SHELL MOLDERS prefer

DOW CORNING 8 EMULSION

SILICONE RELEASE AGENT

*** faster, easier release * minimum build-up — closer tolerance shells * stepped-up production — maximum number of shells between pattern cleanings * easy to apply — faster wetting action * economical in extremely low concentrations * resists creaming or separation * non-flammable * fast delivery from centrally located warehouses**

Other widely-used DOW CORNING silicone products for shell molding include famous *Dow Corning 7 Compound*, unexcelled for breaking in new patterns; and *Dow Corning F-452*, new solvent type release agent.

You can rely on DOW CORNING, originators of silicones for shell molding, to continue providing industry with the most advanced silicone products. The technical representatives in our branch offices will gladly help you make the most profitable use of silicones in your shell-molding operations.

Generous

Free Sample

and latest data on request

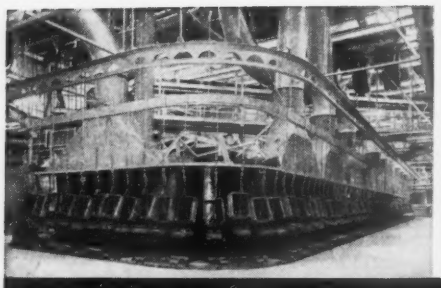
first in silicones — DOW CORNING SILICONES

DOW CORNING CORPORATION

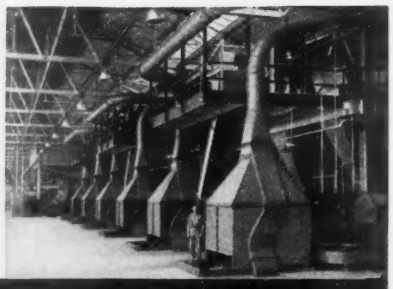
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS DETROIT LOS ANGELES NEW YORK WASHINGTON, D.C. (SILVER SPRING, MD.)

CANADA — DOW CORNING SILICONES LTD., TORONTO GREAT BRITAIN — MIDLAND SILICONES LTD., LONDON FRANCE — ST. GOBAIN, PARIS



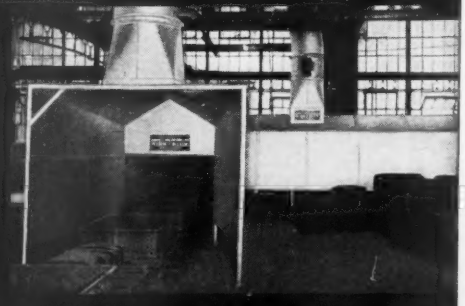
View in new Southern Foundry, shows pouring station with K & B system which removes smoke and fumes as they are formed.



"Shakeouts" in the foundry of a noted implement firm equipped with K & B Dust Control System.

1. DESIGN
2. FABRICATION
3. INSTALLATION

For all three . . . call K&B



K & B Plenum Chamber Hood for mold conveyor operation. Note bolted section construction for ease of maintenance.

For 50 years, Kirk & Blum has specialized in the DESIGN, FABRICATION and INSTALLATION of efficient, dependable systems for the removal of dust and fumes.

DESIGN: Kirk & Blum engineering specialists survey your plant and then design your system, selecting equipment most suitable for your problem.

CONSTRUCTION: Kirk & Blum fabricates the complete system (equipment excepted), "tailor made" for your installation.

INSTALLATION: The Kirk & Blum contract includes responsibility for the entire system, installed by mechanics with years of specialized experience in the installation of such systems. As a result, you have one undivided responsibility—one complete contract for an installed system, ready to operate.

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK & BLUM

DUST AND FUME CONTROL SYSTEMS

The Kirk & Blum Mfg. Company, 3239 Forrer Street, Cincinnati 9, Ohio

tery from the truck. Rate of charge is controlled by the state of charge of the battery. Size and type of charger are dependent upon make and model of truck.

For More Details Circle No. 433—Page 165

Fork Lift Trucks

are redesigned to increase speed and stacking efficiency

Towmotor Corp., 1226 East 152nd St., Cleveland 10, O.—New line of fork lift trucks feature power steering, automatic transmissions and positive-action hydraulic systems.

Lifting capacities from 6000 to 11,000 lb in gasoline, diesel and liquefied petroleum gas powered units are available. Other features include improved maneuverability through design that contributes to balance, positive operating control and dexterous load positioning; adjustable off-center seating and increased power in engines.

For More Details Circle No. 434—Page 165

Photocopy Machine

swiftly and inexpensively reproduces copies of documents

Eastman Kodak Co., Business Methods Sales Division, Rochester 4, N. Y.—Photocopy machine produces several copies of any document in 1 minute, handles up to and including 8½ x 11-in. legal sized paper and can be operated in ordinary room illumination. Manufacturer reports the machine is simple to operate and anyone who needs copies of correspondence, invoices, sales reports, customer records, production schedules or other records can make them after 5 minutes instruction.

For More Details Circle No. 435—Page 165

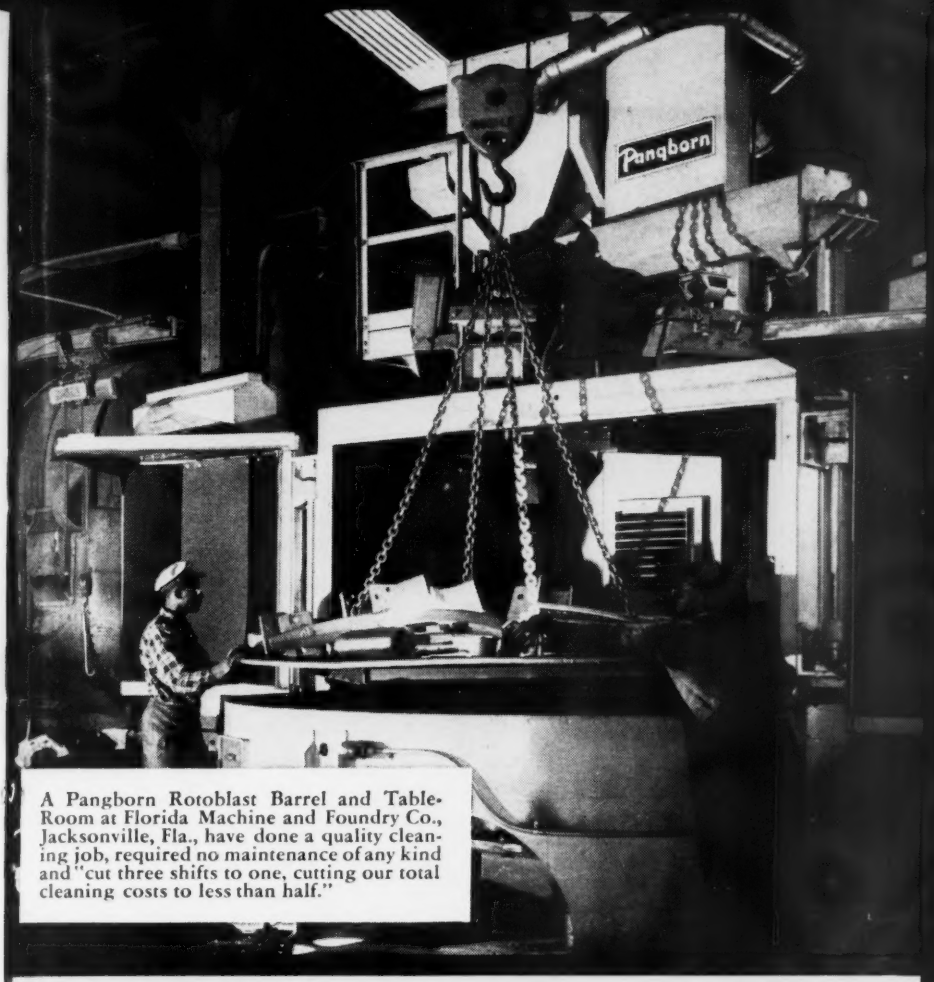
Fire Truck

can go anywhere an ordinary plant lift truck can go

Ansul Chemical Co., Marinette, Wis.—Pint-size fire truck for combating fires inside industrial plants reportedly can go anywhere an ordinary plant lift truck can go. Dry

Circle 665 on Inquiry Card

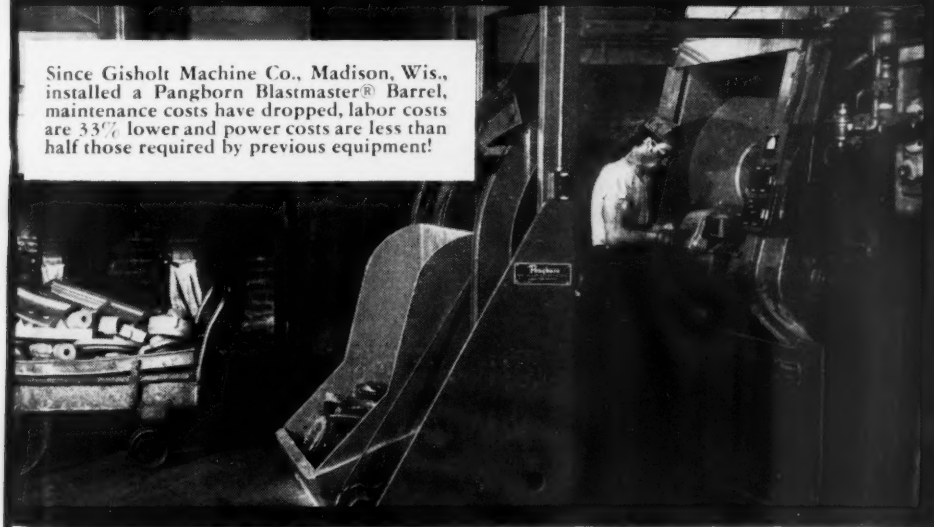
Facing Page—ITEM 666→



A Pangborn Rotoblast Barrel and Table-Room at Florida Machine and Foundry Co., Jacksonville, Fla., have done a quality cleaning job, required no maintenance of any kind and "cut three shifts to one, cutting our total cleaning costs to less than half."

Pangborn Rotoblast® cuts cleaning costs more than 50% at Florida Machine and Foundry!

And cuts maintenance, labor and power costs at Gisholt!



Since Gisholt Machine Co., Madison, Wis., installed a Pangborn Blastmaster® Barrel, maintenance costs have dropped, labor costs are 33⅓% lower and power costs are less than half those required by previous equipment!

The efficiency of a blast cleaning operation is determined by the cost *per ton of castings cleaned.* This overall figure incorporates many cost factors—labor, power, maintenance, speed, abrasive.

Pangborn Rotoblast cuts these costs! Pangborn Rotoblast cleans quickly and automatically . . . production goes up, power and labor costs go down. Pangborn Rotoblast boasts rugged construction and unique design . . . maintenance costs drop, downtime is reduced, abrasive loss is eliminated.

Total these savings and you'll find Pangborn Rotoblast gives you *lowest cost per ton of castings cleaned.* Choose the Pangborn machine best for *you* and slash operating costs!

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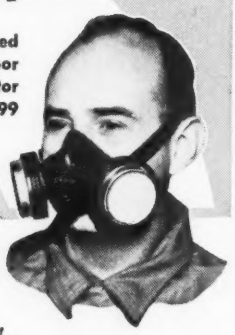

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Single-filter Dust Respirator No. 80

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• Here is an entirely new Dual Cartridge Respirator which carries Bureau of Mines approval. It is designed for use in organic vapors or acid gases. Twin 85 cc cartridges reduce breathing resistance to a minimum.

Rebreathing of exhaled air is prevented by positive-acting inhale and exhale check valves. Cartridges are easily replaced by removing screw-type caps. Valves and headbands are quickly replaced without tools.

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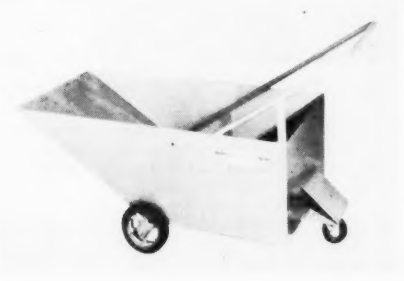
chemical, carbon dioxide and water are provided as extinguishing agents. Accessories available include ladders, utility bar, light, hose, portable extinguishers and extra nozzles, all mounted with panic-proof quick release brackets. There is storage space for fire blankets, boots, air masks, coats and a first aid kit. Unit is designed for one man operation if necessary.

For More Details Circle No. 436—Page 165

Materials Handling Cart

has short turning radius for use in narrow, crowded aisles

Coolant Equipment Corp., Verona 2, Wis.—Materials handling cart for transporting small parts, chips, shavings, clippings and waste has a



height of 20 in. for clearance under work benches, hoppers, feeders or machine tools. Bin type design simplifies loading and dumping. Cart body is mounted on two, 8-in. roller bearing wheels and one, 4-in. swivel caster. Either solid steel or rubber tired wheels are available. Built of 12 gage steel, the cart has a capacity of 7 cu ft and weighs 95 lb.

For More Details Circle No. 437—Page 165

Radiography Equipment

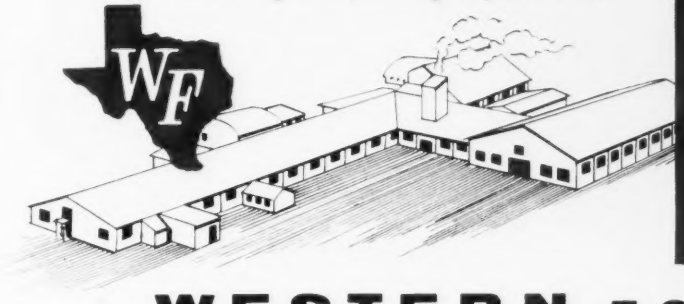
requires no outside source of power and is portable

Budd Co., 2450 Hunting Park Ave., Philadelphia 32, Pa.—Radiography equipment permits use of Cobalt 60, Iridium 192 and other isotopes at distances up to 50 ft from the operator with complete safety from radiation. Unit is designed for panoramic exposures where several specimens are arranged around a source and shot simultaneously, and internal exposures where the source is positioned within a cavity of the specimen and the film placed around the outside. Machine can contain up to four radioactive sources or up to four different strengths of the same source. Unit requires no outside source of power, is portable and contains a locking device to prevent exposure of all sources when not in use.

For More Details Circle No. 438—Page 165

specializing in fast, efficient delivery of castings to manufacturers of cooking and heating appliances.

The Western Foundry Company was founded in 1943 and began operations with 25 employees. Today over 800 people turn out more than 10,000 burner and stove castings a day. The core room can produce 15 to 20 thousand cores per day. Cupola facilities have a 250 ton per day melting capacity. Western delivers to all points west of the Mississippi in the foundry's own trailer trucks. Shipments are also made to Canada, South America and the Caribbean. Services are complete from pattern shop thru foundry, finish machining and painting departments.



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TYLER, TEXAS

Western uses STANDARD silica

In creating highest quality, precision castings, Western Foundry Company uses STANDARD SILICA, the purest, most uniform silica sand in its core room. STANDARD SILICA insures that, when used with Western's own mixing formula, exactly the same superior castings will be formed with each pouring. M. A. Bell Company, serving Western Foundry Company's needs, is distributor for STANDARD SILICA COMPANY.

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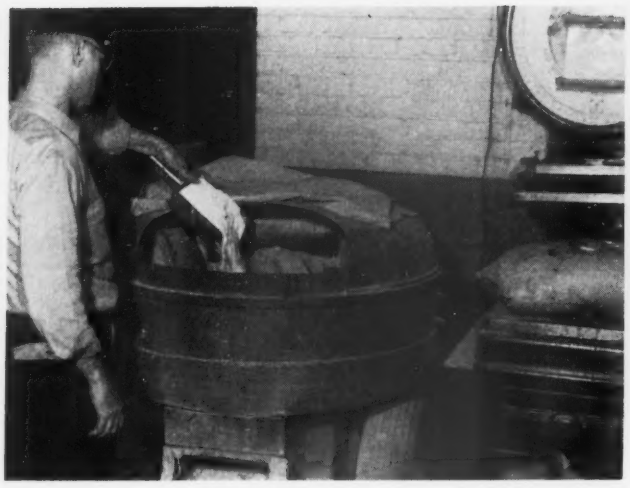


Muller operator adds phenolic resin to sand

Shell-making machine handles 14 x 16-in. plate

SHELL MOLDING'S PART

in Research and Development

By CHARLES E. COTTERMAN
Metallurgist
Buick Motor Division, General Motors Corp.
Flint, Mich.

SHELL molding is different at Buick Motor Division, General Motors Corp., Flint, Mich. Purpose of Buick's shell molding section is to carry on a research and development program and at the same time to produce nonproduction parts which may be used in the plant. As part of Buick's metallurgical department activities, the operation has demonstrated that a shell molding research group can perform as a self-supporting unit.

Shell molding processes have been developed over a two-year period for producing copper contacts, welding electrodes, hone guides, furnace trays and fixtures, cutting tools, and other production tools and fixtures. Thus, experience has been obtained in working with copper, beryllium copper alloys, aluminum bronze, brass, steel, cast iron, high-speed cutting materials, furnace alloys and aluminum. The projects undertaken have originated from several sources. A request for shell molding a particular part might come from the production department, an engineer, the machine repair department or the tool and die shop.

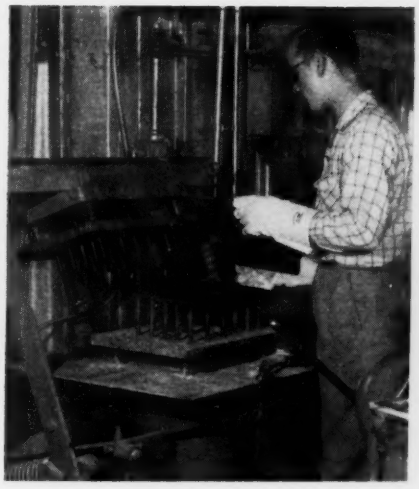
One supervisor who has five men working under his direction conducts the shell molding operation. The foundry is located in the same building as the salvage department. This is advantageous because scrap metal, the major source of material used for producing shell parts, is readily accessible.

Equipment Used—The foundry occupies an area of approximately 1600 sq ft. The major items of equipment consist of a 200-lb capacity portable muller, a cement mixer, a set of scales, a semiautomatic shell making machine which handles a 14 x 16-in. plate, a glue press, two batch ovens, a 60-lb capacity indirect arc rocking furnace, a 300-lb capacity induction furnace, a band saw, a cut-off wheel, a stand grinder, a drill press, a belt sander, three overhead hoists, three hand ladles, a ladle heater and an optical pyrometer. Capital cost has been kept to a minimum by using surplus or salvage equipment wherever possible and by reworking or making the necessary equipment changes and fixtures as needed.

Developing a Hone Guide — The problem of developing a method for shell molding an aluminum bronze hone guide illustrates how an individual part is handled. As purchased from an outside source, these hone guides are fabricated from nylon and have an operational life of approximately six weeks. It was suggested that these guides might be shell molded from aluminum bronze at a substantial saving. An experimental pattern of aluminum was developed with which it was possible to produce several guides. The pattern consisted of four details mounted on a small plate.

The plate was heated in a furnace to 450°F and a mixture of Juniata sand and 5 per cent resin was poured over it by hand. Approximately 30 seconds investment time was allowed, and the excess sand mixture removed. The shell was cured at 450°F, stripped off the plate and laid aside. Cope and drag sections were produced in this manner on separate plates. The two sections were glued together with powdered resin to form the completed shell.

With a sufficient number of shells completed, a melt of aluminum bronze was prepared with the indirect arc furnace. The charge consisted of a mixture of different

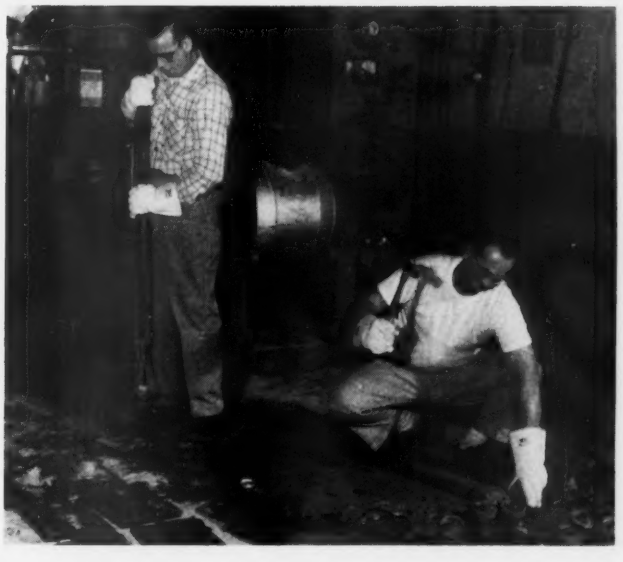


Halves of shells are glued under pressure on this machine

Top Right—Immersion thermocouple is used to check temperature of a nonferrous melt

Pouring molten steel from the induction furnace into a two-man ladle which was preheated to approximately 2200°F

Pouring nonferrous castings. Parts produced include welding blocks, copper contacts, etc.



Small parts are shaken out and broken from the gates before they are sent to the cleaning room

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The SILENT HOIST Heavy-Duty Fork LIFTRUK so rapidly stepped up the production and movement of material, over past handling methods, that this Plant Manager (quoted above), was equally quick to anticipate *fleet* LIFTRUK operations in their plant. *Another example that LIFTRUK pays its way!*

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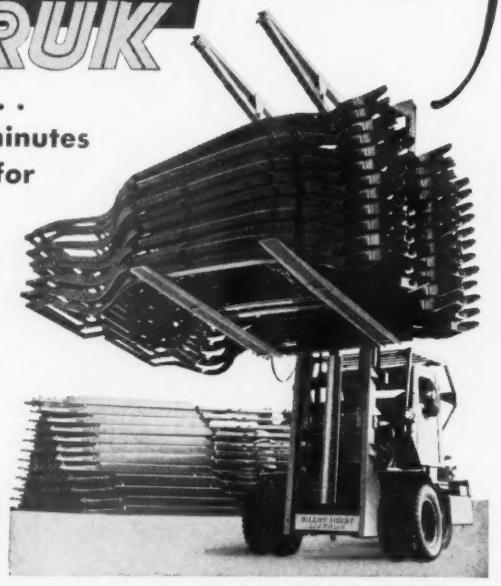

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885 63rd Street, Brooklyn 20, N. Y.

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PRODUCTION PATTERN EQUIPMENT

machined all over and engineered to fit the needs of your foundry

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Anderson Pattern Inc.
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grades of aluminum bronze calculated to produce an alloy with a hardness of Rockwell C 20 in the as-cast state.

The charge was heated to 2250°F and transferred from the furnace to a preheated hand ladle of 20-lb capacity for pouring. The ladle was preheated to approximately 2000°F. Temperature observations were made with an optical pyrometer. The shells were placed on the floor in a horizontal position in a bed of sand and poured. The parts were allowed to cool to approximately 600°F before they were shaken out.

The parts were broken from the gates, cleaned, ground and sanded if necessary. Two small holes were drilled and counterbored. Dimensional checks showed that the parts had been held within limits of 0.005-in. for height and width and 0.010-in. for length. Two sets of guides were placed in service for tryout. They were produced for considerably less cost than that of the nylon guides and lasted five times as long.

Production in Quantity—On the basis of these results, an order was received for 400 shell molded guides. To produce this larger quantity, an aluminum pattern plate was made up for use on the shell molding machine. It consisted of 12 pattern details with minimum draft mounted on half the plate with the sprue and runners on the other half, allowing the cope and drag to be made on the same plate. Pushout pins were placed at the necessary points to strip the shell from the pattern.

Pattern plates were run on the machine at 450°F. The investment period was set at 20 seconds, and 45 seconds were allowed for curing. When removed from the machine, the shell was broken in half. The drag was placed on the gluing machine, its cavities covered with a template and a gluing resin sprinkled onto the shell. The template was removed and the cope and drag bonded under pressure. Since satisfactory results had been obtained with material of the analysis produced during the experimental trials, melting and pouring operations were continued in the same manner.

Experimental Shells — Experimental shells usually are produced when a new part is being adapted to the shell molding process. This procedure permits necessary changes before a regular pattern is produced for use on the shell making machine. In many instances, the experimental work is carried out using the parts themselves as patterns.

Sand Preparation — Sand - resin

Pouring magnesium at Superb Light Alloys Inc., Farmingdale, N. Y.

...WITH *Borden's new* Shell Mold Resin

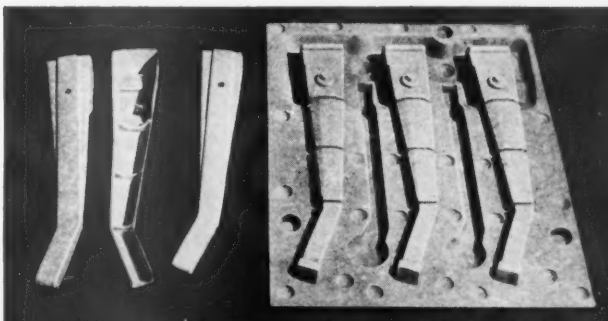
To meet the demand for high dimensional stability and smooth finish in magnesium castings of high-fidelity pickup arms...The Superb Light Alloys Inc. decided to use the modern shell mold process.

Then—to help form the best shell molds possible for their casting . . . these progressive foundry operators selected Borden's new THOR MCF-7 resin.

That's because THOR MCF-7 assures a full thickness build-up—even on regular and vertical pattern surfaces. It produces a flat, rigid shell without warpage. And it strips off the pattern cleanly and easily.

Perhaps Borden's THOR MCF-7 resin in your shell mold process can help increase your production and solve many of your casting problems. If you'd like a trial run—have a Borden technical expert assist you. Write The Borden Company, Chemical Division, Dept. 350 Madison Ave., New York 17, N. Y.

UREA AND PHENOLIC RESIN CORE BINDERS * SHELL MOLD RESINS * CORE SPRAY * CORE PASTE * PARTING AGENTS



Magnesium pickup arms and section of shell mold showing exceptional smoothness and dimensional accuracy.

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THE *Borden* COMPANY

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Control Foundry Chilling with
CHILL KOOLHEAD NAILS
CHILL NAILS and SPIDERS
Choose any style chill nail from jumbo to stubby; slim, medium, or horse nail blade; blunt, pointed, straight or 90° bent. Same types available in Stainless, Brass, Aluminum; Copper coated to order. Spider Chills, jumbo or horse nail legs—double or single. Available in various sizes and types; also made to your individual specifications.
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mixes prepared in the portable muller usually contain 200 lb of Juniata bank sand, AFS 95-105, plus 400 milliliters of kerosene to act as a dust suppresser. After the sand and kerosene have been mixed for approximately 5 minutes, the resin is added and the mixing continued for 20 minutes.

The percentage of resin added depends somewhat on the type of metal to be cast. Mixes generally contain 4 to 5 per cent resin when copper-base alloys are to be poured and 6 to 7.5 per cent resin when steel or furnace alloys are poured. When more strength is required in thin sections of the shell, the amount of resin is increased. Other additions deemed necessary to produce better surface and stripping conditions have been tried and usually are added at the same time as the resin.

Pattern Construction—All original patterns are as simple as possible. This construction usually consists of mounting the metal pattern on the plate and then adding the gates, pouring sprue and push-out pins. An effort is made to get progressive solidification from the farthest point out on the casting up to the pouring basin, thus eliminating the need for risers. Occasionally, risers must be used to obtain the required results. Draft is held to a minimum.

Melting—Shells are stored until a sufficient quantity has been produced to warrant pouring a full melt. The two types of electric furnaces used for melting were mentioned earlier—a 60-lb indirect arc rocking furnace and a 300-lb induction furnace. The indirect arc rocking furnace is used to melt both ferrous and nonferrous metals, and the induction furnace is used for melting steel. Furnace linings consist of magnesite or high alumina refractory for ferrous melting and sillimanite for the nonferrous melts.

Patterns are designed to permit the parts to be broken off the gates whenever possible, to save time and reduce costs. When necessary, however, band sawing, rubber wheel cutting and torch or arc cutting are used. Cleaning and repairing are kept to a minimum by properly fabricating and gluing the shells. Precautions include gluing the shell tightly, keeping resin and loose sand out of the mold cavities and eliminating broken corners. Surface conditions can be affected by dirty metal, pouring temperatures, per cent of resin mixed with the sand and the shell surface.

Typical Shell Molded Parts—Parts produced by shell molding in Buick's

For more information, use Reader Service Card, page 165

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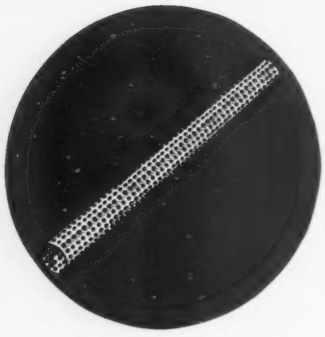
TUBES



PERFORATED TUBE

Made from tinplate. Used as substitute for core wire.

FLANGED TUBE

Of plain tinplate, flanged to lock firmly in sand

BUTT JOINT TUBE

Available in lengths up to 6 inches, diameters up to 1 inch. Inquiries invited on other sizes.

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research foundry and the savings which resulted include these:

1. Flash welding blocks of beryllium copper were cast for approximately one-third the cost of those purchased from an outside source.
2. Copper contacts were made for less than 10 per cent of the cost of machining from bar stock.
3. Nut welding electrodes of beryllium copper were produced for 10 per cent of the cost of the machined part.
4. Furnace spacers for ring gears were cast at a cost of 75 per cent of the purchased price.
5. Another furnace spacer was produced at a saving of 33-1/3 per cent.
6. Hone guides were shell cast at a 25-per cent reduction in individual item cost, and operating life was increased five times.

These are examples of the savings that have been realized by shell molding nonproduction parts instead of by performing expensive machining operations or purchasing them from outside sources. Often, the delivery problem can be eliminated because many parts needed immediately have been shell molded and placed in service much faster than they could have been obtained from outside sources.

Investment Casting Institute Issues Metal Specifications

New material specifications to aid design engineers and others specifying investment-cast parts have been released by the Investment Casting Institute, Chicago. They are the result of several years of research and study by the institute's metal specifications committee to formulate specifications compatible to both user and producer requirements.

The first of the industry sponsored specifications include the following: FE-1, a general iron-base specification on carbon steels; FE-2, low-alloy steels; CO-1, cobalt-base superalloy; NI-1, nickel-base superalloy; MG-1, magnesium-base aluminum-zinc alloy; AL-1, silicon-magnesium and silicon-copper aluminum alloys; and CU-1, silicon-brass.

Each specification is identified by a code number in accordance with the new code number system developed by the Standardization Plan of the Secretary of Defense. Copies of specifications may be obtained from suppliers of investment castings or may be purchased from the Investment Casting Institute, 27 East Monroe St., Chicago 3. If they are ordered from the institute, cost is 10 cents per specification.

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Makes Foot Baths and other methods obsolete!

AND PEOPLE LIKE TO USE SANI-MIST, because it "refreshes" their feet. It's so clean and sanitary . . . as personal as your own toothbrush. Kills athlete's foot fungi in 30 seconds with no chance of dilution or contamination.

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CORE BOX INSERTS OF BERYLLIUM COPPER HELPED THE LEBANON STEEL FOUNDRY BOOST PRODUCTION AN ALMOST UNBELIEVABLE 1400%... COST OF EACH CORE WAS CUT 70%

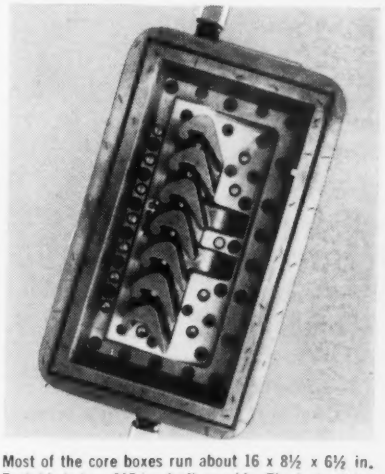
The first core box with beryllium copper inserts, made 4 years ago, has turned out 20,000 cores so far and is still in excellent condition! Reports Lebanon, "We may get 20,000 more cores blown out of that box, maybe 40,000, or even 60,000. There seems to be no end to the amount of wear the beryllium copper inserts will take."

In order to mass produce intricate armored steel louver castings for Army tanks, Lebanon purchased two coreblowing machines. The core box design, however, created very severe wear conditions for the metal inserts used. The space between the blades in the core box was only ¾ in., and to form the sand completely in these narrow spaces, blow holes had to be drilled in the core box between each blade. With a hole diameter of ⅜ in., there was left only 3/16 in. clearance between the hole and the blade on each side.

The erosive force of the sand blasted through the blow holes under a pressure of 90 psi dished out bellies and chipped the aluminum and chromium plated iron inserts after a production run of only 500 cores. These eroded spots made it impossible to eject the core from the box. Tolerances were completely lost . . . the coremaking machine had to be shut down, the core box dismantled and sent to the pattern shop. Sometimes weeks of valuable production time was lost.

Since 1952, Lebanon has been using "BERYLCO" brand beryllium copper core box inserts—of the original 244 beryllium copper inserts purchased, every single one is still serviceable. Shutdown time due to core box repair, and the wasted labor and time in clerical work, transportation, and reconditioning, have been eliminated.

A technical bulletin describing in greater detail the use of beryllium copper inserts in core boxes, and an all-new castings catalog listing the various "BERYLCO" beryllium copper alloys, their physical properties and casting advantages, will be sent to you upon request. Write today.



Most of the core boxes run about 16 x 8½ x 6½ in. Each blade has .015 in. draft per side. The body of the box is constructed of aluminum with steel facing, and weighs approximately 75 lb. when assembled, including the beryllium copper inserts.

BERYLCO®

THE BERYLLIUM CORPORATION

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AO Specialty Safety Products

Windows Interchange Quickly on the Splash Proof **AO H5** FACE SHIELD

Introduced only last year, this face shield has proved very popular. Any H5 Window (acetate, screen or fibre) can be attached quickly and easily by: 1. Sliding back two end clips; 2. Placing slotted window over five studs; 3. Turning top of three centre studs to vertical position; 4. Sliding the end clips forward over back edge of window. Chemical splashes cannot enter between window and headgear but roll off the crown down outside of window.

(Model 200X)

6 Advantages of **AO SENTRY-LITE**

Prevents injury — panic — pilfering — sabotage — goods spoilage — work stoppage . . . goes on instantly, automatically when power fails! Lights 10,000 sq. ft. for 12 hours or longer — shuts off automatically and recharges when power resumes. Portable, excellent auxiliary light. Requires water once a year.

It's Adjustable! **AO 372-14**

Straightaway Sound Protector

Manual adjustment knob permits wearer to control pressure as harmful industrial noise increases or decreases — a comfort feature. Protector covers jawbone opening. Excellent for low and high frequency noise levels. Durable Neoprene rubber covered metal spring type headband. Dielectric vinyl sponge earcups provide complete ear seal. Easily sterilized. Many other features. Write for literature.

Note: On hot days and hot jobs, keep production UP, accidents DOWN with low cost, AO Sweatbands. Check your supply today.

Your nearest AO Safety Products Representative can supply you

Always Insist on AO Trademarked Safety Products

American Optical

SAFETY PRODUCTS DIVISION

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Circle 717 on Inquiry Card

Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Circumstantial Evidence"

A GREAT deal has been said and written about circumstantial evidence. Innocent men have been executed on the strength of it, and guilty men have depended on it for their freedom. Admission of such evidence is not, however, confined strictly to courts of criminal law. We suffer because of it nearly every day of our lives in the foundry! Our experience may not be dramatic, and certainly it is not headlined in the daily press, yet it is deadly to profits and morale.

When Alexander Pope said, "A little knowledge is a dangerous thing," he was referring to human activity in general, but if he had been referring specifically to the foundry, he would still have been right! A little knowledge is not enough in this business, yet that *little* is all we have.

In my humble opinion, two of the wisest sand experts in America (both friends of mine—I won't embarrass them by naming them here), have but comparatively little knowledge of this inexhaustible and fascinating subject. And I'm sure that they would be the first to admit it.

A Long Way To Go—We've come a long way in our knowledge of foundry sand practice, but we have a long way to go! Our laboratory instruments, remarkable though they are, don't tell us everything we need to know. Our sand-handling and conditioning machinery is being improved as rapidly as the genius of our inventors can do so, yet they too have problems that probably now seem insurmountable, but which will be solved.

Some day even a very small foundry will have an effective and efficient method of cooling sand, without taking up too much room or spending too much money. Plans for such a method may now be forming in the *unsuspected* mind of your most inconspicuous worker. Don't overlook this possibility. Remember,

Circle 677 on Inquiry Card→

The "PLANOBOT" - another example of PLANET'S Automation Engineering

The "PLANOBOT", which served cokes to visitors at Planet's booth, was a hit at the Foundry Show. It picked up, opened and poured the coke and then returned the bottle automatically. It was designed by Planet for an automotive manufacturer to transfer die castings automatically from machine die to the next operation.

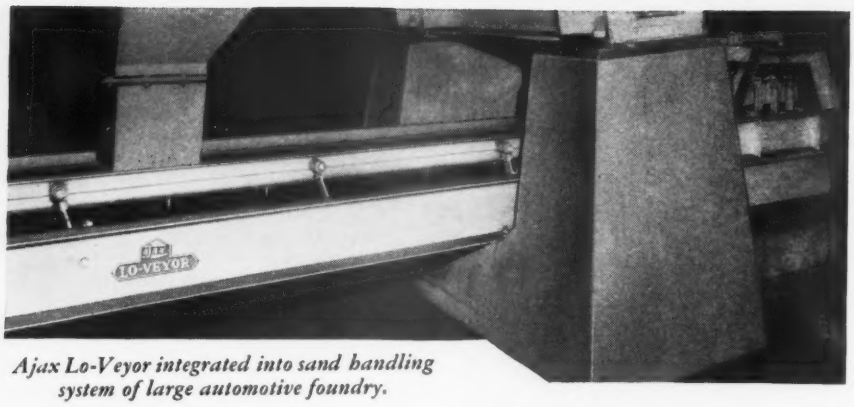
This machine has a timing plate which controls any desired cycle combination of movements . . . the grasping device on the horizontal arm opens and closes and rotates 360 degrees and the arm will extend or retract, raise and lower, and rotate 360 degrees. Adjustments can be made in a matter of minutes to set the "PLANOBOT" for an entirely different cycle of operations. It is truly a Universal Transfer Device.

The "PLANOBOT" is just one example of Planet Corporation's engineering and designing skill. Planet engineers are experienced in applying automation to casting handling systems, cooling conveyor systems, briquetting systems, core sand systems, molding sand systems, and shell molding systems. Let them help solve your problems. Write or call today for a Planet Sales Engineer. There's no obligation, of course.

PLANET CORPORATION
1818 SUNSET AVENUE
LANSING, MICHIGAN

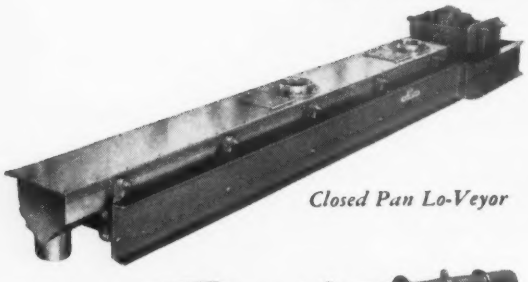
- CONVEYORS
- ENGINEERED SYSTEMS
- FOUNDRY EQUIPMENT
- AUTOMATION
- STEEL FABRICATION

IT PAYS TO PLAN WITH PLANET

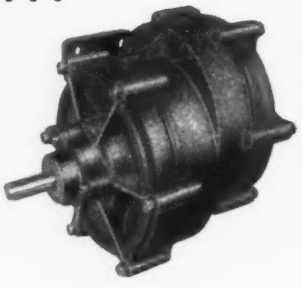


Ajax Lo-Veyor integrated into sand handling system of large automotive foundry.

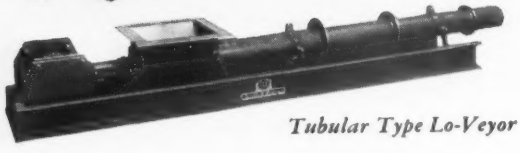
AJAX **LO-VEYORS**
convey bulk materials at low cost . . .



Closed Pan Lo-Veyor



Ajax reciprocating drive, the heart of Ajax Vibrating Conveyors.



Tubular Type Lo-Veyor

FAST: Ajax Lo-Veyors take the place of shovels, wheelbarrows and other slow-moving bulk materials handling methods. They handle large tonnage in sizes from 5 microns up to large lumps and materials of various moisture contents.

CAPACITIES: Made in lengths from 3 ft. up,—they are used as feeders and for long runs with units in series. They are often integrated and synchronized with production lines between departments and machines.

LOW HEAD ROOM: Space saving installations, under floors and overhead, are made easy by low height averaging less than 14" except at point where shaker is located.

CUT MAINTENANCE COST: All idler rollers, head and tail pulleys eliminated. No lubrication problem. Operates satisfactorily in severe conditions of dust and abrasive laden air.

ENGINEERING SERVICE: The broad experience of Ajax engineers is available to give you the latest thinking in handling bulk materials. An outline of your problem will bring you some worthwhile answers.

AJAX FLEXIBLE COUPLING CO. INC.
WESTFIELD, N. Y.
Circle 678 on Inquiry Card

people laughed at the Wright brothers!

To get back to this point on circumstantial evidence, it is not an uncommon occurrence for a molder — even a machine molder—to have trouble with his copes. It may be a pocket stick-down during the draw or a drop or sag, either before or after closing the mold.

But whatever it is, you invariably hear a chorus of voices blaming the sand. Usually they are right. The sand may not be adequate for the work it is expected to do. More than 50 per cent of defective castings can be traced directly to sand failure. I would be even less intelligent than some of my associates suspect if I questioned that fact or if I defended a sand that had been "proved" deficient. But, gentlemen, my point is that *cope trouble* need not necessarily stem from poor sand properties.

A 36 x 36-in. cope without bars or some sort of arbor support, and often with weighty pockets, imposes a strain beyond the capacity of most green sand. Or, again, the draw-mechanism may be out of adjustment, producing a pinch-off or mold distortion, difficult to detect during the operation of the machine.

The pattern may not be properly secured, and thus permit a horizontal movement, again difficult to observe, yet quite enough to cause trouble. Check everything before you jump on the sand man. As one expert has observed, "Sand isn't always to blame!"

Nevertheless, jumping at the conclusion, usually on the basis of circumstantial (or insufficient) evidence, nine men out of ten damn the sand—and even seem disappointed when they "find the squirrel up another tree."

A Case in Point—On a recent cold morning in the chipping room, three department heads were holding a post-mortem examination over castings that had been pronounced dead and were about to be returned to the furnace for cremation, without benefit of clergy. The gentlemen in question were assembled in a speculative mood, intent on determining the cause of the tragedy.

One called it "core blow," due to excessive oil or water or a poor oven. The second voice attributed the defect to wet molding sand, hard ramming and low permeability. The third man insisted that it was simply a case of wild or gassy metal.

There you have it—circumstantial evidence, each man seeing what he expected and wanted to see, convincing himself that he couldn't be wrong. The incident here related

is not imaginary. It actually occurred as described, and because of an unusually observant chipper, all three opinions were proved wrong.

What actually happened was that the core was loose in the print, and because the molder had neglected to secure his vents, they were completely choked with molten metal. The poor core had to "blow!"

This reason subsequently was discovered when one of the castings, which had not had the core removed, revealed the iron-filled vent.

Your sand mixer has presumably been instructed in the method of mulling sand as you want it. You may have explained to him why he uses a certain sand together with specified ingredients and then warned him of the necessity for critical moisture control. You may have gone even a step or two further to impress upon him indelibly that a sand mix which may be tops on one job will fail completely on another.

But we again are reminded that "A little knowledge is a dangerous thing," and you can't just lay down a few general rules, applicable to certain *types* of work.

Two patterns may be so similar in many respects that most molders might consider them as identical—and certainly a sandman would. Yet the experienced foundryman has that knowledge which detects the *difference* and indicates to him the need for special treatment.

Our sandman is guided, however, by the only evidence he can recognize, and that is extremely circumstantial because he hasn't the basic facts.

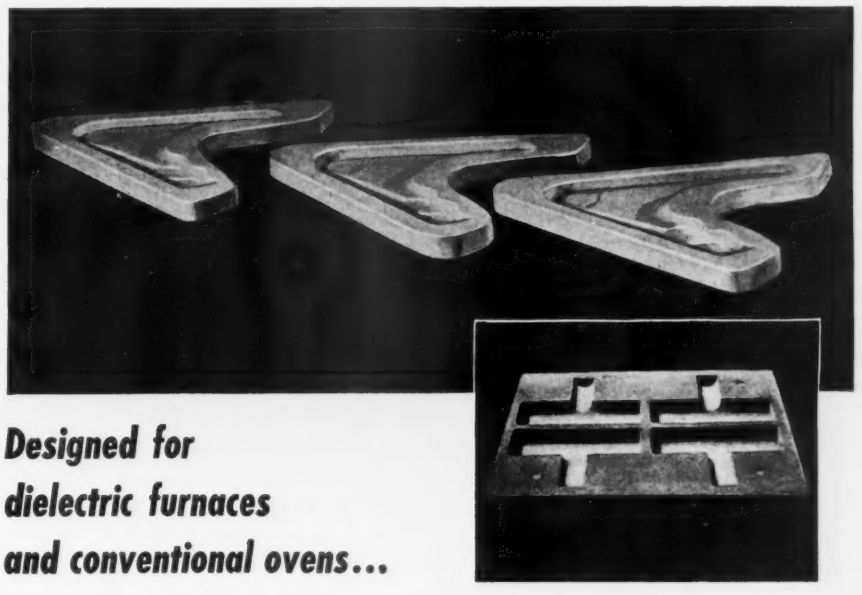
Even an average muller man may be completely conscientious in his work, taking an obvious pride in his daily performance. But unless you stand over him, dictating his every move, there will be sand failure.

So you either must accept this probability with your fingers crossed or do the sensible thing—that is, educate that boy in sand practice to the very limit of his capacity. Don't just tell him *how* sand properties are developed: Tell him *why!*

Technical Trifles — The more he knows about the "technical trifles" of sand control, the more analytical he becomes in striving to reduce the daily scrap-pile, the more valuable your investment will be. And to this extent, at least, our entire industry will benefit.

If you must educate molders or melters, you certainly should extend the education of your sandman. In my own case, I was acknowledged as a mechanic at the end of four years of training. I was presented with a union card and journeyman's wages and led to believe that I could hold up my end as a molder anywhere in the world. The fact that I was speedily disillusioned in this pretentious belief is quite beside the point. At this writing, I have endured, but thoroughly enjoyed, 13 years of my apprenticeship as a sandman and I look forward to the next 13 with a great degree of expectation.

"The boss told me to get rid of anything that hasn't moved for six months."



Designed for dielectric furnaces and conventional ovens...

J-M Pallite Plates and Form Driers afford desirable operational advantages

Service records prove that Johns-Manville Pallite outperforms and outlasts many other materials in use in dielectric type furnaces. The advantages of Pallite are due to its special formulation, developed by Johns-Manville for use in dielectric furnace core-drying operations in foundries. Pallite offers the following desirable characteristics:

- **light weight**
- **uniform electrical conductivity**
- **uniform thermal conductivity**
- **dimensional stability**
- **nonsweating**
- **moisture-absorbent**

Pallite Plates are now available in both flat and grooved form. Pallite Form Driers are also available, contoured to support irregular shaped cores properly during their travel through the furnace. For details about J-M Pallite materials, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville PALLITE

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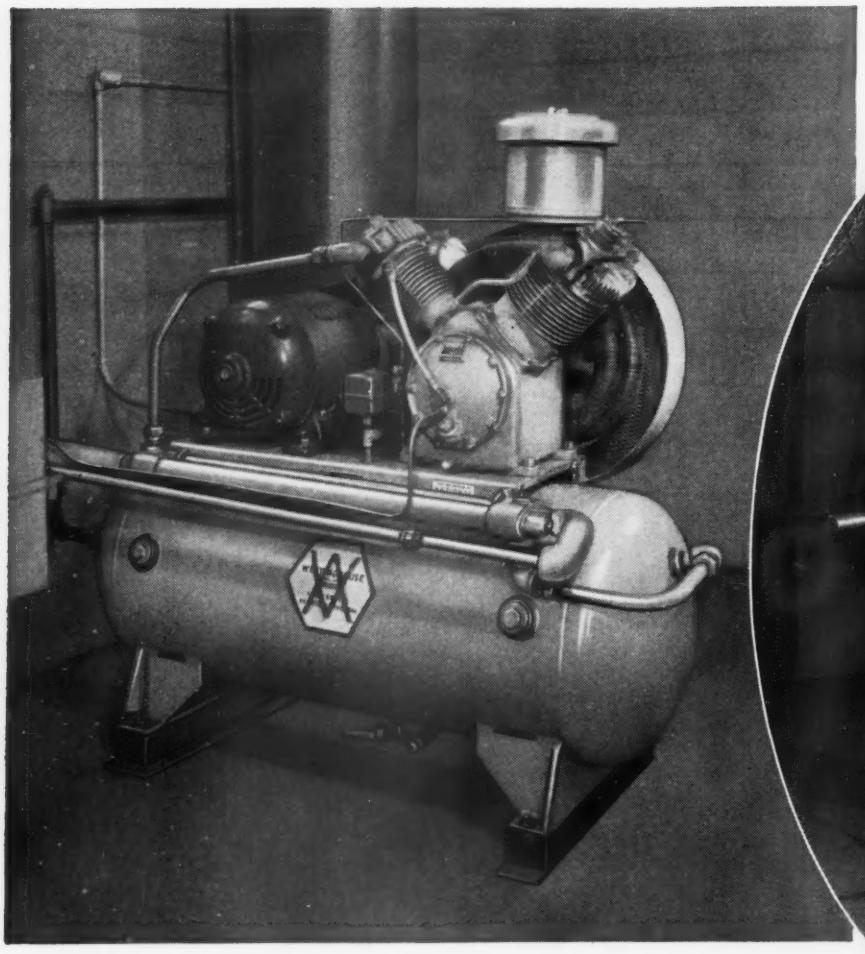
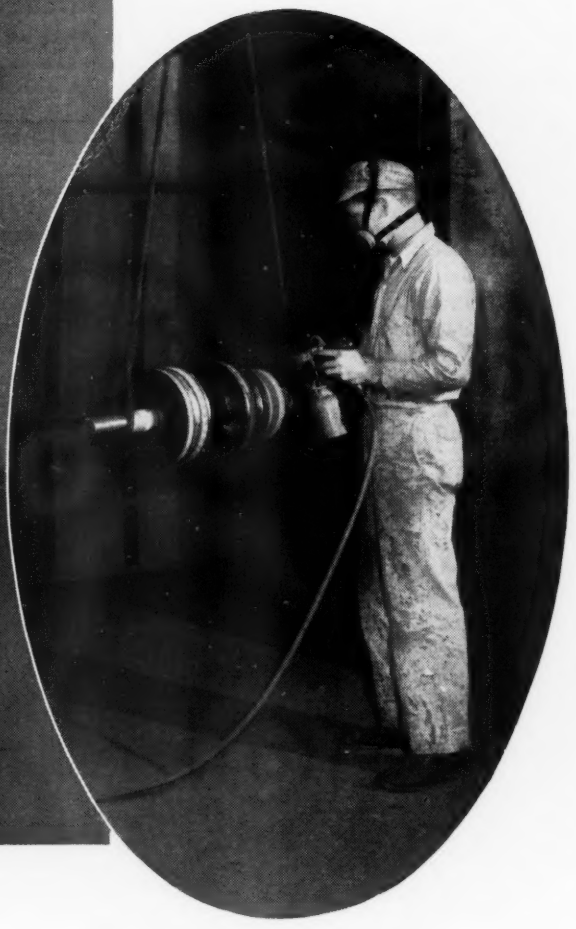




Paint a Brighter Profit Picture

. . . use the flexibility of air to cut costs in your plant, and Westinghouse Air Compressors to cut the cost of your air

Spray painting, drilling, bolting, grinding, punch press operation — there are countless ways that the flexibility of air power cuts costs, improves profits.

Because air power is so useful, it is important to have a dependable supply — important to have a Westinghouse Compressor.

Only Westinghouse can give you all 15 of these features: Type M inlet filter, disc valves, enclosed crankcase, anti-friction main bearings, pressure lubrication, low oil level protection, enclosed starting unloader, adequate cooling fins, "Y" type construction, high velocity flywheel fan, large size intercooler, thermal overload protection, greater weight, dual control, and one-year warranty period.

So paint a brighter profit picture. Use air power and get it at its low-cost best from a Westinghouse Air Compressor. Sizes up to 40 horsepower. Write for details.

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 1 Wisconsin

PORTABLE AIR COMPRESSORS • TRACTAIR • STATIONARY AIR COMPRESSORS • ENGINES • AIR TOOLS

Distributors in all principal cities

Foundry Statistics

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1954	624,973	158,473	214,408	245,291	.....
1955					
Mar.	78,958	16,019	29,029	33,229	110,046
3 mo.	210,241	42,956	77,027	88,282	.....
Apr.	73,049	14,041	28,028	30,208	109,156
May	71,691	14,235	25,597	31,243	104,984
June	68,473	14,920	24,682	27,939	102,799
July	55,033	11,716	21,006	21,656	101,024
Aug.	64,864	14,916	22,267	27,004	105,994
Sept.	67,069	14,769	23,075	28,532	111,696
Oct.	72,197	14,485	25,135	31,741	120,222
Nov.	75,065	14,327	26,267	33,852	126,954
Dec.	75,275	15,291	25,031	34,347	123,363
Total	832,957	171,656	298,115	354,804	.....
1956					
Jan.	74,152	15,861	24,528	33,253	121,924
Feb.	73,096	15,560	23,963	32,949	115,958
Mar.	73,785	16,597	22,816	33,965	110,642
3 mo.	221,033	48,018	71,307	100,167	.....

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1954	812,016	461,982	.....	.....	.....	.....	.....
1955							
Mar.	102,364	60,063	.....	.....	.....	.....	99,730
3 mo.	270,371	156,784	.....	.....	.....	.....	.....
Apr.	101,226	57,397	.....	.....	.....	.....	104,091
May	98,397	57,317	.....	.....	.....	.....	106,446
June	99,456	60,261	.....	.....	.....	.....	107,559
July	75,570	44,914	.....	.....	.....	.....	115,420
Aug.	82,448	48,126	.....	.....	.....	.....	123,473
Sept.	87,215	55,471	.....	.....	.....	.....	116,636
Oct.	90,866	53,804	.....	.....	.....	.....	121,261
Nov.	99,280	58,069	.....	.....	.....	.....	116,981
Dec.	99,946	60,409	.....	.....	.....	.....	123,107
Total	1,104,775	652,552	.....	.....	.....	.....	.....
1956							
Jan.	93,562	54,618	79,406	45,747	14,156	8,871	116,520
Feb.	93,533	54,466	80,601	47,606	12,932	6,860	113,616
Mar.	86,941	46,266	75,384	40,869	11,557	5,397	106,491
3 mo.	274,036	155,350	235,391	134,222	38,645	21,128	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1954	835,930	753,179	48,848	.....
1955				
Mar.	92,149	83,149	5,649	42,940
3 mo.	239,635	215,457	14,925	.....
Apr.	84,183	75,903	5,152	51,111
May	85,008	76,064	5,513	49,198
June	90,476	80,869	5,840	45,820
July	65,816	59,138	3,998	48,085
Aug.	87,206	77,721	5,322	51,251
Sept.	89,600	80,481	5,603	57,313
Oct.	91,192	82,958	4,513	56,751
Nov.	90,345	80,934	5,807	57,049
Dec.	88,287	78,327	6,368	57,146
Total	1,011,748	907,852	82,201	.....
1956				
Jan.	89,767	80,116	6,135	58,445
Feb.	91,706	82,244	5,888	57,515
Mar.	96,085	85,094	6,299	65,560
3 mo.	277,558	247,454	18,322	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1954	25,777	22,950	.....
1955			
Mar.	2,572	2,311	7,011
3 mo.	7,037	6,387	.....
Apr.	2,633	2,405	6,800
May	2,399	2,174	6,530
June	2,367	2,098	6,346
July	1,920	1,763	5,912
Aug.	2,176	2,002	5,964
Sept.	2,478	2,260	5,670
Oct.	2,302	2,077	5,394
Nov.	2,325	2,148	5,805
Dec.	2,255	2,018	5,981
Total	27,892	25,332	.....
1956			
Jan.	2,959	2,600	6,237
Feb.	2,977	2,720	6,704
Mar.	3,046	2,842	6,414
3 mo.	8,982	8,162	.....

PRODUCTION WORKERS

Estimated Number

(Thousands)

	Mar. 1956	Feb. 1956	Mar. 1955
Ferrous	259,200	260,000	229,100
Nonferrous	87,100	89,000	84,200

Average Weekly Earnings

Gray Iron	83.23	83.23	81.54
Malleable Iron	83.85	84.26	82.96
Steel	95.68	94.16	84.46
Nonferrous	87.53	87.10	85.28

Average Weekly Hours

Gray Iron	41.0	41.0	41.6
Malleable Iron	40.9	41.1	41.9
Steel	43.1	42.8	41.0
Nonferrous	40.9	40.7	41.0

Source: Bureau of Labor Statistics

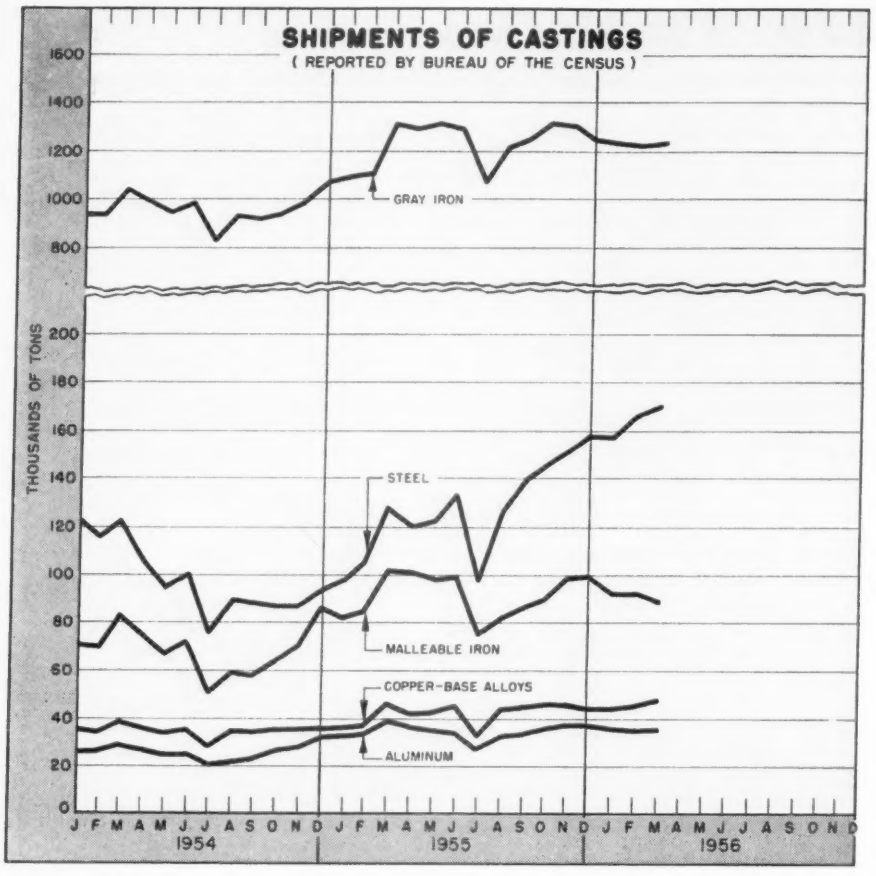
GRAY IRON CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[3]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	Total[3]	Total[3]	
1954	11,532,158	6,322,989	7,292,292	3,064,886	1,784,625	843,899	325,859	1,376,671	743,711	.....
1955										
Mar.	1,314,918	688,733	847,874	334,287	217,571	109,681	36,732	129,746	82,995	934,224
3 mo.	3,513,006	1,830,057	2,280,275	908,348	605,821	306,482	89,916	325,669	211,325	.....
Apr.	1,293,678	679,867	819,872	319,149	216,116	108,490	35,415	145,871	76,404	966,057
May	1,310,424	707,105	803,897	315,072	227,236	117,915	35,966	168,772	74,553	937,949
June	1,296,196	715,862	793,067	327,520	228,044	117,727	43,807	147,351	83,927	981,918
July	1,069,711	579,122	634,869	246,297	210,130	112,137	28,181	129,191	67,340	1,049,565
Aug.	1,226,312	688,317	718,423	301,502	238,007	121,071	29,298	156,074	84,510	1,160,466
Sept.	1,252,736	712,688	731,073	314,223	244,199	124,811	29,953	165,332	82,179	1,150,933
Oct.	1,310,309	713,671	795,875	327,827	245,749	122,722	31,877	160,875	75,923	1,113,336
Nov.	1,305,633	696,523	797,854	327,580	262,506	127,739	29,795	148,560	66,918	1,061,546
Dec.	1,259,740	663,993	786,480	328,445	262,056	133,115	30,833	133,935	46,436	1,075,477
Total	14,837,745	7,987,205	9,161,685	3,715,963	2,739,864	1,392,209	385,041	1,681,630	869,558	.....
1956										
Jan.	1,249,518	677,017	769,826	326,269	257,150	132,581	32,408	131,346	58,788	1,157,818
Feb.	1,214,769	680,494	739,786	322,956	242,207	128,643	35,074	133,254	64,448	1,140,765
Mar.	1,255,405	715,173	752,498	331,749	254,045	139,624	42,676	132,384	73,802	1,162,578
3 mo.	3,719,692	2,072,684	2,262,110	980,974	753,402	400,848	110,158	396,984	197,038	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[3]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1954	1,184,096	880,158	135,581	802,321	580,474	120,309	381,285	303,428	15,315	.....
1955										
Mar.	127,460	98,926	19,339	88,867	68,013	17,887	34,933	30,913	1,452	215,059
3 mo.	332,128	254,699	49,649	230,883	172,843	46,030	104,719	81,856	3,619	.....
Apr.	120,053	92,237	16,646	84,247	63,244	15,163	35,806	28,993	1,483	221,336
May	122,465	92,713	16,810	85,950	63,182	15,335	36,515	29,531	1,475	225,302
June	133,887	102,457	19,591	93,417	69,986	17,979	40,470	32,471	1,612	251,416
July	97,875	71,170	11,631	68,094	48,140	10,666	29,781	23,030	965	354,628
Aug.	126,406	96,290	20,576	91,245	68,514	19,094	35,161	27,776	1,482	413,531
Sept.	140,843	107,622	23,594	100,775	76,156	21,991	40,068	31,466	1,603	420,616
Oct.	145,674	110,409	23,745	105,345	79,235	22,375	40,329	31,831	1,370	418,063
Nov.	152,381	116,908	25,635	111,571	84,064	24,050	40,810	33,518	1,585	453,113
Dec.	158,982	122,201	29,003	116,872	88,894	26,919	42,110	33,307	2,084	475,335
Total	1,530,694	1,166,706	236,880	1,088,489	814,258	219,602	445,769	354,452	17,278	.....
1956										
Jan.	158,618	123,343	27,954	116,092	88,480	26,362	42,526	34,863	1,592	519,401
Feb.	165,398	128,598	30,833	123,279	94,998	29,112	42,119	33,600	1,721	567,330
Mar.	170,045	130,839	31,991	126,583	95,779	29,953	43,462	35,060	2,038	594,990
3 mo.	494,061	382,780	90,778	365,954	279,257	85,427	128,107	103,523	5,351	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.



COKE PRODUCTION AND CONSUMPTION

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1954	59,526,723	59,139,159	2,479,926
1955			
Mar.	6,235,909	6,306,723	286,072
3 mo.	17,436,001	17,688,077	763,138
Apr.	6,135,645	6,164,459	278,242
May	6,426,747	6,570,567	277,967
June	6,148,026	6,297,338	249,525
July	6,169,770	6,266,631	221,372
Aug.	6,395,422	6,439,101	249,425
Sept.	6,397,133	6,501,013	260,608
Oct.	6,630,609	6,813,118	283,818
Nov.	6,545,862	6,577,008	285,021
Dec.	6,865,032	6,949,073	284,936
Total	75,150,247	76,266,385	3,154,052
1956			
Jan.	6,914,836	6,182,704	275,660
Feb.	6,476,135	6,506,044	260,949
Mar.	6,886,556	6,850,851	266,756
3 mo.	20,277,527	19,539,599	802,431

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1955	1956
Jan.	25,201	27,736
Feb.	25,349	24,949
Mar.	29,713	28,310
Apr.	27,641	25,808
May	23,708	.....
June	23,141	.....
July	18,513	.....
Aug.	27,013	.....
Sept.	26,349	.....
Oct.	25,228	.....
Nov.	25,102	.....
Dec.	21,448	.....
Total for year	298,406	106,803

Source: Defense Council of the Ingot Brass and Bronze Industry

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1954	520,501	322,845	.....
1955			
Mar.	71,811	44,048	81,363
3 mo.	188,982	115,413	.....
Apr.	71,595	45,477	81,756
May	63,735	38,124	74,472
June	66,569	42,753	71,344
July	47,928	27,429	68,927
Aug.	62,677	61,957	75,592
Sept.	62,030	43,498	80,660
Oct.	71,689	46,581	85,489
Nov.	75,099	47,572	93,001
Dec.	70,950	47,547	86,120
Total	781,254	516,351	.....
1956			
Jan.	68,050	43,750	83,234
Feb.	66,854	42,300	76,283
Mar.	65,760	42,806	73,025
3 mo.	200,664	128,856	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1955	1956
Jan.	81.0	195.6
Feb.	90.4	169.0
Mar.	163.6	152.7
Apr.	178.6	....
May	145.7	....
June	186.8	....
July	213.4	....
Aug.	134.0	....
Sept.	156.7	....
Oct.	108.6	....
Nov.	154.4	....
Dec.	183.9	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

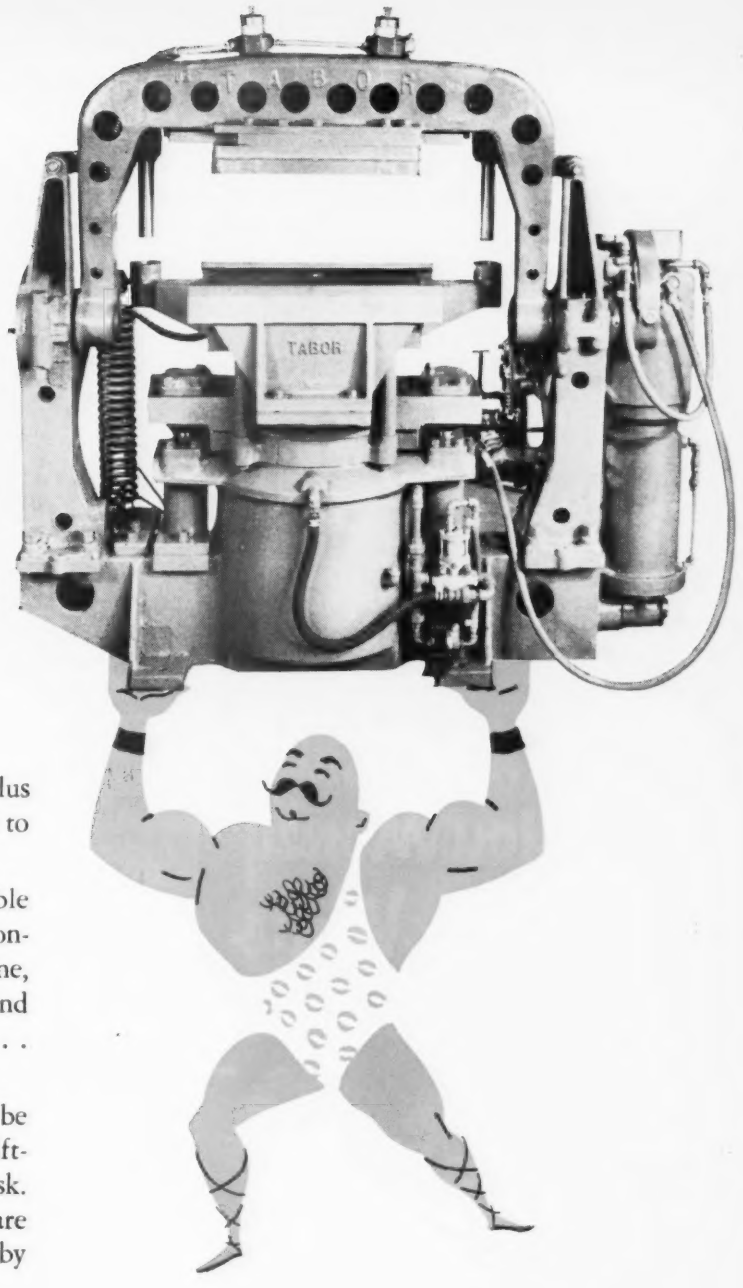
	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1954	54,780,758	8,542,581	855,207	6,100,444
1955				
Feb.	5,350,452	823,465	91,916	577,296
2 mo.	10,766,504	1,637,147	182,538	.....
Mar.	6,313,717	993,266	113,198	727,401
Apr.	6,239,036	975,751	108,965	726,138
May	6,415,947	963,082	109,074	745,060
June	6,117,573	928,908	116,419	733,573
July	5,447,130	730,735	81,216	623,623
Aug.	5,913,031	868,644	101,607	765,343
Sept.	6,060,491	881,158	119,550	753,318
Oct.	6,443,349	944,685	113,411	820,642
Nov.	6,441,351	952,906	112,056	839,971
Dec.	6,496,796	910,675	115,436	830,404
Total	72,654,925	10,786,957	1,273,470	8,757,593
1956				
Jan.	6,688,977	909,201	114,378	880,980
Feb.	6,345,421	892,373	116,418	833,661
2 mo.	13,034,398	1,801,574	230,796	1,714,641

PIG IRON PRODUCTION AND CONSUMPTION

	Production** (Standard grades—net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons) Total	Cupola	Air	Electric
1954	58,113,924	2,241,436	2,798,646	47,485,047	5,587,465	52,373,541	4,364,418	215,158	155,258
1955									
Apr.	6,329,927	210,085	305,188	5,068,506	746,148	5,725,258	467,709	21,536	12,857
4 mo.	23,860,818	884,982	1,189,912	19,436,577	2,349,347	20,723,076	1,766,770	85,052	71,405
May	6,753,236	246,661	342,544	5,385,299	788,732	6,044,882	471,657	21,448	20,085
June	6,494,838	238,412	347,631	5,245,861	662,934	5,774,896	454,751	22,871	21,697
July	6,329,393	233,235	344,365	5,116,960	634,833	5,430,550	361,171	16,483	19,535
Aug.	6,529,580	251,459	319,951	5,214,901	743,269	5,769,689	442,532	22,014	25,685
Sept.	6,653,578	252,630	343,919	5,397,134	659,895	5,903,190	445,099	23,340	24,552
Oct.	6,905,280	267,405	315,045	5,647,527	675,303	6,193,512	470,610	22,659	23,328
Nov.	6,636,649	241,727	353,713	5,404,584	636,625	5,973,223	469,485	22,621	18,148
Dec.	6,887,667	242,446	329,607	5,660,307	655,307	6,131,680	444,459	23,520	21,971
Total	77,114,073	2,858,957	3,884,971	62,570,394	7,799,751	68,944,698	5,326,534	260,008	246,406
1956									
Jan.	6,985,945	210,755	317,216	5,806,140	651,774	6,275,224	441,634	24,062	11,766
Feb.	6,539,199	229,440	370,208	5,350,650	588,901	5,871,824	430,792	24,307	13,010
Mar.	7,083,877	196,533	352,856	5,843,852	690,636	.....	.....	.....	.....
Apr.	6,860,833	210,319	333,660	5,623,647	693,207	.....	.....	.....	.....
4 mo.	27,469,854	847,047	1,374,000	22,624,289	2,624,518	.....	.....	.....	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

it's time to look at stack molding again



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From left to right, at the fundamental papers session, W. D. Walther, Ford Motor Co.; W. A. Snyder, University of Washington; D. V. Ragone, University of Washington; and M. C. Flemings and Howard F. Taylor, MIT

Fundamental Papers Session

New to Congress Program

Concluding reports on technical sessions of the recent AFS Congress are presented here. Discussions reported in the June issue covered Brass and Bronze, Malleable Iron, Plant Equipment, Industrial Engineering, Education, Heat Transfer, Refractories and Gray Iron

AN innovation at the recent AFS congress in Atlantic City was the addition of a "Fundamentals Papers" session to the already numerous sessions relating to specific subjects.

As pointed out by the presiding chairman, Prof. Howard F. Taylor, Massachusetts Institute of Technology, the category is a flexible designation. It will deal not only with papers concerned with basic concepts of castings' metallurgy and metallography, etc., but also with others which by their nature do not fit logically into other sessions.

Metal Solidification in a Flowing Stream—M. C. Flemings and C. M. Adams, Massachusetts Institute of Technology, Cambridge, Mass., and E. E. Hucke, University of Michigan, Ann Arbor, Mich. Presented by Mr. Flemings, the paper discussed the various modes such as the plane solid front of pure metals without impurities to interfere, columnar dendritic, equiaxed crystal, and flowing while freezing. Type of solidification may be changed in some cases by stirring the metal or alloy while freezing. Centrifugal casting acts somewhat akin to stirring.

New Method for Determining the Effect of Solidification Range of Fluidity—D. V. Ragone, University of Michigan, and C. M. Adams and H. F. Taylor, Massachusetts Institute of Technology. Presented by Mr. Ragone. Numerous variables affecting fluidity include intrinsic properties such as heat content and heat of fusion, composition, viscosity, surface tension, and test equipment used.

Proposed method employs small-bore, heat-resistant glass tube with one end sealed and the other attached to a vacuum chamber. Tube is in horizontal position with the sealed end bent down for immersion in molten metal. Sealant is a material which will melt when tube is immersed, and the vacuum employed is related to the specific gravity of the molten metal. So far the procedure has been employed only with low-melting-point metals. It appears to provide consistently accurate results, and offers possibilities for application

to commonly used metals and alloys.

Quantitative Evaluation of Susceptibility of Various Alloys to Shrinkage Defects—Richard A. Flinn, University of Michigan. Usual types of shrinkage include centerline, riser neck, interdendritic and surface type. Avoidance of shrinkage may be accomplished by having a sufficient supply of liquid metal and keeping an open channel between it and the solidification front. In some alloys the rate of crystal formation from the surface to the center of the section is the determining factor.

Mechanism for Pore Formation in Solidifying Metal—W. D. Walther, Ford Motor Co., Dearborn, Mich. Investigation indicates that fine pores or porosity in center of cast sections may be due to the solidification procedure from the exterior surface to the interior creating venturi throat sections in the late stages of freezing. Those sections in connection with the small flowing metal stream form minute low-pressure areas or vacuums which are cut off or closed by junction of inwardly growing crystals.

LIGHT METALS

PROGRAM of the Light Metals Division included three technical sessions and a roundtable luncheon. Among subjects discussed were centrifugal casting of unusual shapes, machinability of aluminum die castings, properties of several new alloys, modifications in vertical gating principles and gas in light alloys.

Centrifugal Casting of Unusual Shapes in Nonferrous Alloys—J. P. Krishon, Centr-O-Cast & Engineering Co., Detroit. Author's company, after experimentation, has devised a centrifugal casting method that offers cost reducing potentials for some types of work. The paper covers the production casting of an adapter plate for automotive use which after x-raying and sectioning indicated stronger structure than obtainable by gravity methods. One man operating two molds is able to produce 300 or more castings per 8-hour day. Scrap is less than 6 per cent. Castings are trimmed in a conventional crank type press by one operator at a rate of 1400-1600 castings daily. After trimming, no grinding is required. Unit cost savings of more than 40 per cent can be realized in converting some parts to centrifugal casting techniques. Yield is high and extensive savings are realized in cleaning operations.

Discussion—Die material used is a hot pressure die mold of No. 3 steel. One foundryman indicated that all aluminum can be centrifugally cast successfully. Machine is turned on, allowed to run at 160 rpm, receive molten metal and coast to a stop.

Machinability of Aluminum Die Castings—D. L. Colwell and Oldrich Tichy, Apex Smelting Co., Cleveland. Presented by Mr. Tichy. Machining is an important factor in the acceptance of aluminum die castings. Machinability can be improved by close attention to composition of the metal, with careful control of its zinc content. Porosity due to entrapped air can be minimized by proper gating and venting. Die lubricants should be used sparingly to avoid porosity from excess lubricants. Lubricants with suitable solids in suspension are usually more satisfactory than the indiscriminate application of oil over the face of the die.

Good housekeeping practices will eliminate oxides and other nonmetallic inclusions. Thorough fluxing and mixing in the melting furnace also are essential. Metallic inclusions caused by sludging or segregation can be eliminated by not charging cold metal into the holding furnace and by operating the melting furnace at a high temperature while thoroughly stirring the melt.

Discussion—It is best to use a deep stir reaching all the way to the bottom of the furnace. Authors use only dry fluxes. Chlorine gas is an excellent fluxing agent but nitrogen doesn't do the job that chlorine does on the No. 220 alloy. Many commercial fluxes are available but experience indicates that a neutral flux produces most satisfactory results. Time interval after fluxing to allow oxides to rise or settle must be determined for individual situations.

Novel Aluminum Engine Die Castings—E. N. Jacobi, Briggs & Stratton Corp., Milwaukee. In Mr. Jacobi's absence his paper was not presented. It will appear in the AFS *Transactions*.

Tensile Properties of Al-Si-Mg Alloys and the Effects of Sodium Modification—R. C. Harris, S. Lipson and H. Rosenthal, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia. Presented by Mr. Harris. Object of the investigation was to study the tensile properties of Al-Si-Mg alloys of the 356 type from the standpoint of the effect of four variables: Sodium modification, effect of magnesium content, effect of silicon content and effect of intermediate room temperature aging interval between solution treatment and artificial aging treatment. Sodium in amounts from 0.02 to 0.05 per cent was added to several melts, and castings were poured after various holding times.

Small variations in the Mg content of Al-Si-Mg alloys in general and the 356 alloy in particular produce a pronounced effect on tensile properties. Allowable range of Mg content in the 356 alloy is capable of producing a spread of 4000-7000 psi in the observed yield strengths.

Small variations in Si content have little effect on tensile properties of alloys of approximately the 356 composition. The variation became significant when less than approximately 1.2 per cent Mg is present.

Sodium modification does not appear to be beneficial to the heat-treated 356 type alloy. Modification effects that improve mechanical properties are observed to some degree in alloys containing 5 per cent Si and less than approximately 0.2 per cent Mg.

For aging times up to six hours, sodium additions do not significantly alter the aging characteristics of the 356 type alloy. Time required to age to maximum hardness is essentially the same for both modified and normal alloys. Maximum hardness attained appears to depend on the Mg content.

Al-Si-Mg alloys of the 356 composition must be used in the underaged condition if satisfactory elongation values are to be obtained. (In this condition full strengtn potentials are not realized.)

A significant impairment of the tensile and yield strengths with an improvement in elongation occurs as a result of an extended time interval between solution treatment and artificial aging treatment. Room temperature aging effects occurring over a period of 24 hours are sufficient to lower the tensile and yield strengths by 4000-5000 psi.

Discussion—The purer the metal the greater the elongation, so it is best to attempt to control impurities as much as possible. Other phases of modification, in addition to those reported in the paper, have remarkable effects on end products.

An Evaluation of ZH62XA Mg Sand Casting Alloy—K. E. Nelson, Dow Chemical Co., Midland, Mich., and W. P. Saunders, Dow Chemical Co., Madison, Ill. Presented by Mr.

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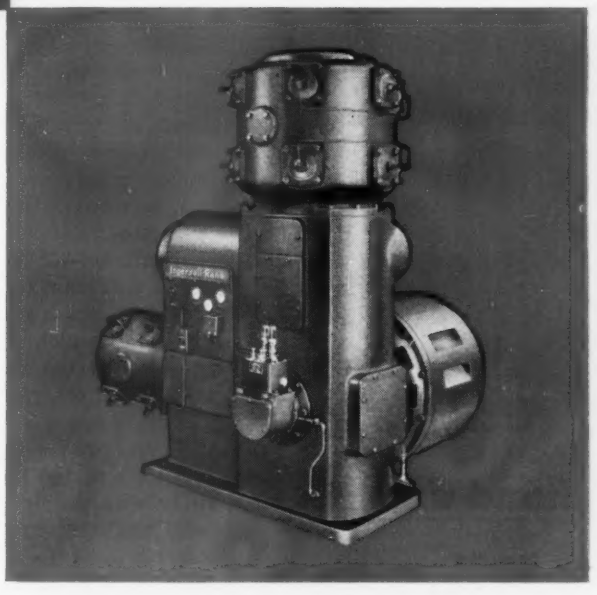

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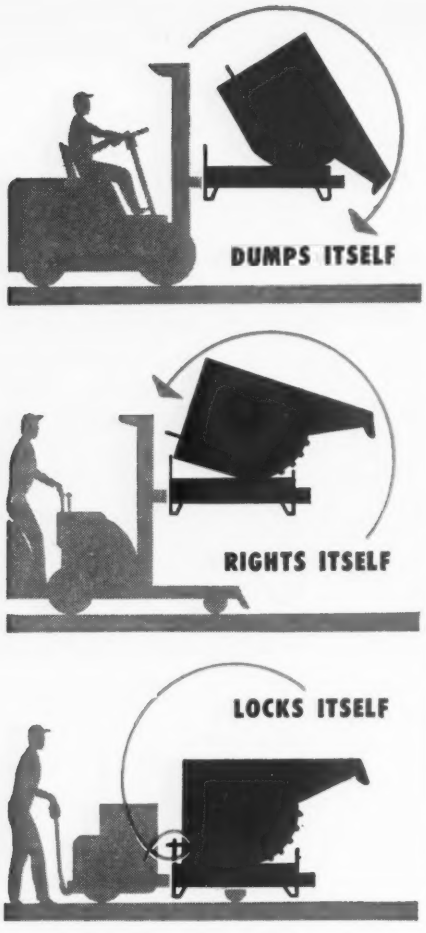

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Nelson. This alloy provides a high-strength structural material for use up to 300°F. Composition: Mg + 5.7 per cent Zn + 1.8 per cent Th + 0.7 per cent Zr, has a low tendency toward microporosity. Other castability considerations dictate it be rated with other Mg-Th-Zr alloys below Mg-Al-Zn and Mg-RE-Zr alloys.

The alloy possesses excellent tensile properties at room temperatures, and its creep resistance at moderately elevated temperatures appears to be improved over alloy ZK51A. It can be joined by usual methods, including welding, by either argon-arc or heli-arc methods. Standard procedures recommended for chemical treatment of commercial sand cast Mg alloys can be used with ZH62XA-T5. Selection of the Zn range within which to control composition is based on many compromises. Best combination of castability, tensile properties and weldability is obtained at a sacrifice of one or more of these properties.

Discussion—J. W. Meier, Dept. of Mines & Technical Services, Ottawa, Can., also has conducted studies with this alloy which agree in some respects with the data presented and disagree in others. He felt that the authors made a wrong interpretation and improper use of evaluation standards. He stated the casting used for study was poorly gated and admittedly unsound. An English foundryman has used the XK51 alloy in small and large airframe castings and would rate its properties higher than did the authors.

Effects of Section Size Variations in a Test Casting on Properties of Some Mg-Al-Zn Alloys—W. E. Pearson, Dow Chemical Co., Midland, Mich. Test casting, termed a "slope casting," provides a range of tensile properties equivalent to those found in production castings of Mg alloys. It has proved useful in alloy development work to provide tensile property data for thin and thick sections, heat treatment studies, grain size and porosity tendency work.

Discussion—Slope casting is useful if used as only a shape in a series. To be of real value it should incorporate all possible ramifications of properties that might be obtained when castings are made commercially. A wedge or slope casting cannot provide cooling rates indicative of normal conditions, which generally involve a mixed cooling rate rather than a pure cooling rate. Only valid data must come from sound test bars, and one must establish a plot of test bar properties against the cooling rates. There is need for

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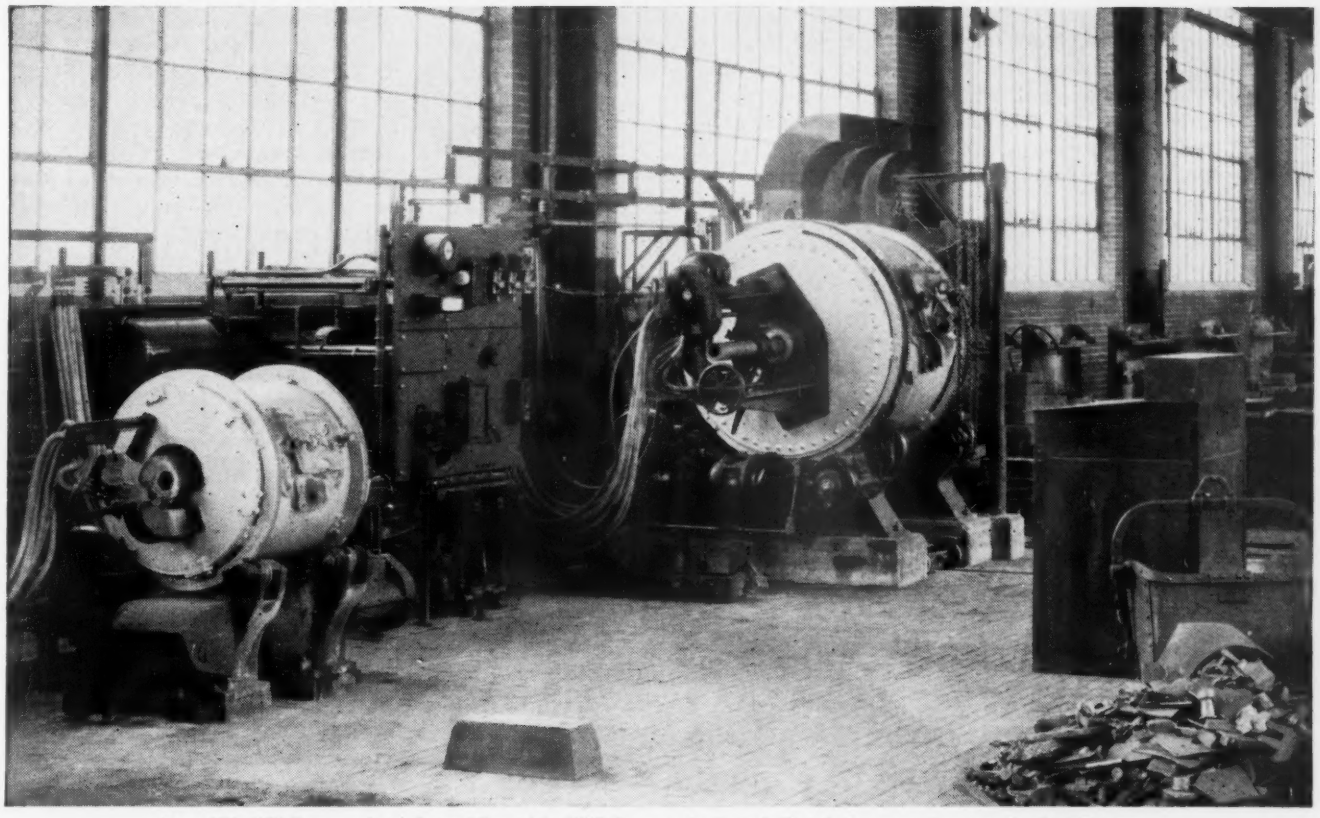

Type LFA, 350 lb. capacity, left, and Type AA, 1000 lb. capacity Detroit Electric Furnaces. In operation for 25 years.

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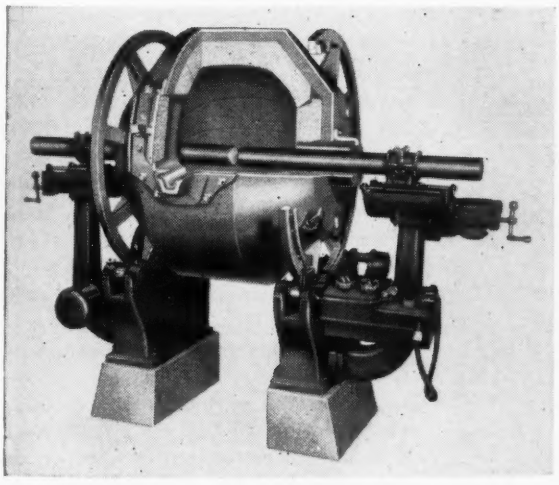

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some measure of "complete soundness."

A Tensile Bar Shell Mold for Light Alloys—K. L. Herrick and R. C. Harris, Frankford Arsenal, Philadelphia. Presented by Mr. Harris. Object of study was to develop a tensile bar mold design for use in casting aluminum by the shell mold process. Design causes metal stream entering from opposite ends of mold cavity to join at grip end of bar. Tensile properties of 356, 220, 40E and 195 alloys were evaluated at 1400, 1325 and 1250° F pouring temperatures and with risers which were made in four different sizes.

Properties of 356, 220 and 40E cast in shell molds were found to be equal or slightly better than the tensile properties of the alloys when cast in green sand molds.

Properties of 195 alloy cast in shell molds were significantly lower than the tensile properties of 195 when cast in green sand.

Thermal gradients along the axis of the tensile bar were essentially symmetrical from the center of the gage length. Riser size did not affect thermal gradients in the gage length portion of the shell cast tensile bar but did affect solidification time.

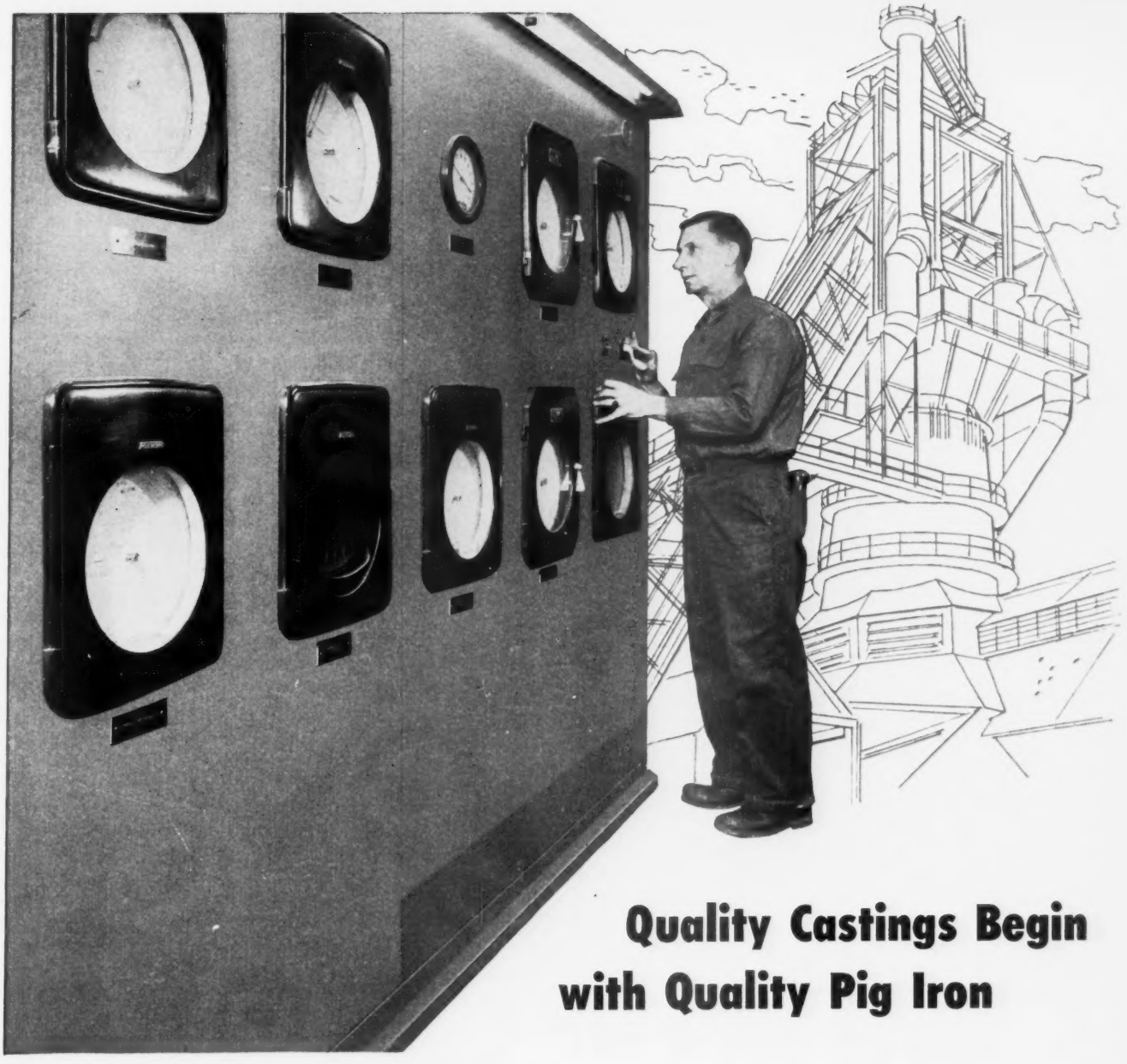
Modifications in Vertical Gating Principles—K. R. Grube, R. M. Lang and J. G. Kura, Battelle Memorial Institute, Columbus, O. Presented by Mr. Lang. Paper covered additional investigation on vertical gating systems to make its principles of fluid flow adaptable to more castings. It is recommended that an intermittent web or step gate be used to replace the formerly recommended side riser. No increase in turbulence results but some trouble with thermal gradients might occur, and caution must be exercised when the step gate is used. Test movies taken during experiments were shown to portray patterns of metal flow when various size web dimensions were used.

Discussion—No attempt was made to correlate viscosity and density of water versus aluminum but experiments have shown that when castings were made in aluminum the patterns between water and liquid metal were quite similar. Gating cannot be divorced from risering, but experiments up to now have been to get a clean casting. Future work will be done to correlate flow patterns with solidification phenomena.

New Aluminum Permanent Mold Casting Alloys C355 and A356—R. C. Lemon and H. Y. Hunsicker, Aluminum Co. of America, Cleveland, Presented by Mr. Hunsicker. Paper presents the chemistry and characteristics of two high-purity alloys which, in the various available tempers, present to the design engineer a wide range of tensile properties for stressed parts. Where maximum strength is desired and ductility requirements are moderate, alloy C355-T62 may be used. Alloy A356-T6 should be advantageous for parts subjected to accidental overloading, particularly by impact loads, and parts requiring that only deformation and not fracture result from such overloading.

Discussion—Walter Bonzack, North

Convention visitors thronged to watch the operating exhibits at the show



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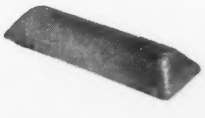

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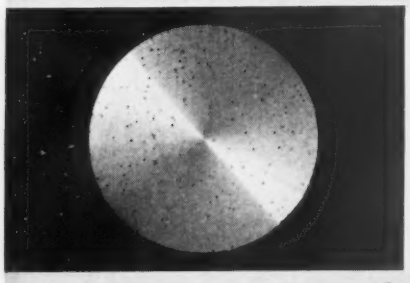
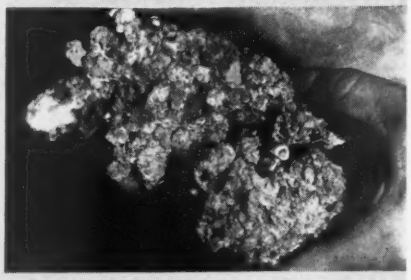
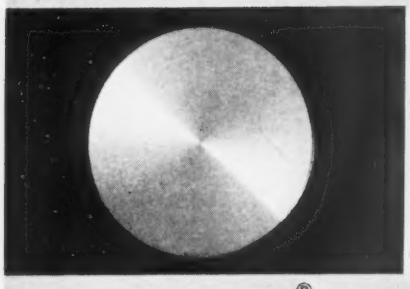




are eliminated



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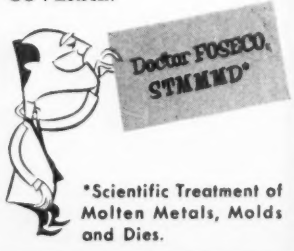

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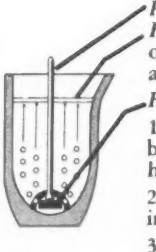

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Hollywood, Calif., in a written discussion indicated his experiments were in disagreement with the tensile and yield strengths reported by the authors; he measured elongations about 100 per cent greater. The authors felt the differences reported were due to different heat treating techniques used. Heat treat practices could not be elaborated on but the authors suggested a careful study of the curves presented in the paper would be revealing.

New Aluminum Casting Alloy XA140 for Elevated Temperature Applications—R. C. Lemon and W. E. Sicha, Aluminum Co. of America, Cleveland. Presented by Mr. Lemon. A new aluminum casting alloy for elevated temperature applications contains 8 per cent Cu, 6 per cent Mg and 0.5 per cent each of Mn and Ni. At temperatures up to 400 to 600°F, the tensile and fatigue strengths are reported superior to those of other commercial aluminum casting alloys. Resistance to loss of high temperature strength upon prolonged heating is said to be outstanding. Potential applications are gas turbine accessory equipment and certain airframe and guided missile parts. Alloy has good casting characteristics and some parts have been cast successfully in permanent molds, but it may be necessary to compensate for a mild hot cracking tendency.

Methods and Apparatus for Measuring Gas Contents in Melts—Sam Lipson, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia. Reviewed methods for satisfactory measurement of gas content in melts, with emphasis on the reduced pressure solidification test for aluminum. It is essential for foundrymen, especially those doing aircraft work, to know the gas contents of melts.

Application of Degassing Methods to Production—W. A. Mader, Oberdorfer Foundries Inc., Syracuse, N. Y. Discussion of techniques that can be used for reducing pinhole and microporosity. Methods touched on were: Allowing melt to solidify in the crucible, degassing by dry atmosphere, bubbling gas through the melt, gas fluxing and vacuum degassing.

Production Results and Casting Quality—B. J. Alperin, Erie Foundries, General Electric Co., Erie, Pa. There is much to learn about degassing techniques and there must be some general agreement as to what degree of porosity an acceptable casting can contain. Various alloys have different abilities to hold or contain gases. Sales appeal of a porous casting is greatly affected

Facing Page—ITEM 689→

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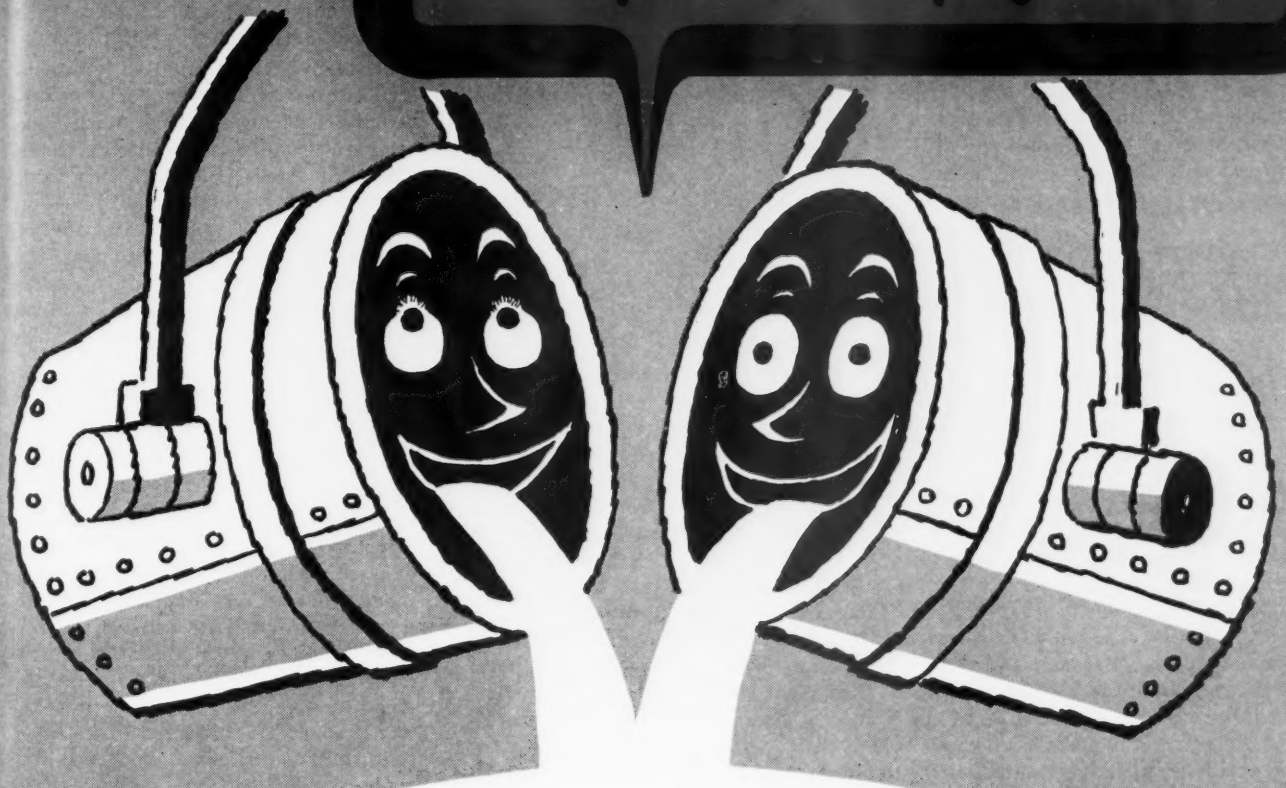

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though casting is of acceptable quality and meets service requirements.

Discussion — Three papers above were brief presentations at a roundtable luncheon. General questions were asked of the panel members. It is best to superheat melt so it does not have to be brought up to temperature again after degassing. Fast or slow solidification is relatively unimportant, but direction of solidification is vital. If melt is chilled, freezing will start at bottom and gas will be forced out upwards.

Most water vapor develops from furnace atmosphere, and to combat this problem a slightly oxidizing atmosphere is preferred. It is difficult to contain gas content in induction furnaces under medium vibration. Also it is difficult to get a transducer of satisfactory quality to introduce vibrations to the melt. As-cast test bars generally will reflect intermediate gas contents. Good test bar qualities are not always indicative of the end quality of the castings.

STEEL CASTINGS

IN THREE technical sessions and a roundtable luncheon, steel foundrymen discussed deoxidation practice, hot tears, sand properties as related to defects, gas removal, cleaning operations and use of inorganic binders to solve shell molding problems.

Effects of Aluminum and Titanium Deoxidation on Cast Steel — R. D. Ahles, W. R. Nestle, C. H. Weight and R. S. Zeno, General Electric Co., Schenectady, N. Y. Mr. Zeno presented the aluminum section and Mr. Ahles the titanium section. In an effort to eliminate pinholes, deoxidation practice was investigated using both aluminum and titanium as the deoxidizing agents. A serious operation problem was encountered with titanium and it was necessary to revise practice to get low-sulphur heats. There is a question as to how far the titanium-sulphur relationship can be pursued.

Titanium is understood to be a grain refiner, but it also can be a grain coarsener. There is a big price difference between titanium and aluminum, but if pinholes in castings are to be eliminated, titanium will accomplish the objective.

Hot Tearing Characteristics of Acid and Basic Steel Castings Determined by High-Temperature Testing—C. F. Christopher, Continental Foundry & Machine Division, Blaw-Knox Co., East Chicago, Ind. This was a study of the high-temperature dynamic properties of a series of steels varying in chemical composition and methods of manufacture. Results showed that all steels exhibit a limited brittle zone under the solidus and that temperature limits of this zone are proportional to carbon content. Hot tearing of castings can occur only when liquid is present at the grain boundaries.

Visitors paused as they entered to inspect patterns and castings which won national prizes in the annual apprentice patternmaking and molding contest

Cleaning room costs constitute as high as 30 per cent of the total cost of production of steel castings. The hot tearing repair responsible for part of these costs varies to some extent with type of product. Much of this repair could be reduced if the fundamentals of hot rupture were better understood.

Basically, the solution to hot tearing is to avoid wide temperature differentials during freezing. With wide temperature differences, high stresses and high stress concentrations exist on intricate designs and section changes. These stresses cause hot tearing in areas not yet past the brittle temperature zones. Castings must be heated, gated and chilled so as to avoid wide temperature differentials.

Some Aspects of Dust Suppression in Foundries—C. M. Stoch, British Steel Castings Research Association, Sheffield, England. Methods of dust suppression fall into two main groups —dust prevention and dust control. Development work was done on local exhaust systems applied to grinding machines, and modifications made to insure improved dust control on pedestal grinding machines. Dust flow characteristics of swing frame grinders were examined and experimental work done on the integral exhaust and combined integral and booth systems.

No clear indication regarding the degree of suppression achieved or required can be made since no generally accepted efficiency figures or method of assessing efficiency exists. In assessing the degree of dust control by local exhaust systems, investigators often concentrate on assuring that the operator's "breathing zone" has the same dust count as the general atmosphere or that no dust clouds reach it. Although there is a wide field for improvement, present knowledge of dust problems and methods available will, if applied intelligently, greatly improve working conditions in foundries.

Eliminate Grinding—Lower Cost of Cleaning Operations—Frank Newberry, Oklahoma Steel Castings Co., Tulsa, Okla. Carbon arc-compressed air pad washing has reduced grinding and cleaning costs for this company. It is used to remove gates, riser pads, fins, nails and excess weld deposit after gates and risers have been removed by oxyacetylene torch and repair welding has been performed. Two 600-amp rectifier welding units, tied together, are employed with an electrode holder fitted with a ¾-in. head to take ¾-in. copper-clad carbon electrodes.

Welding machines are about 10 ft

from the booth, with the welding cable passing through a compressed air hose and attached to the holder. Compressed air at 80 psi is used at the torch. Air is turned on before making contact with the metal to be removed so that the melted metal will be blown away. The operator then moves the electrode back and forth in a rhythmical fashion and removes the metal.

Since gates and risers are cut on the average of 3/16-in. high, all the metal usually can be removed at one pass. Metal is blown away as rapidly as it is melted, and there is no difficulty with carbon pickup. Copper-clad electrodes are more economical than plain carbon or copper-coated electrodes. Company experience is that the carbon arc process removes metal approximately 20 per cent faster than swing frame grinding.

Inorganic Binders Solve Shell Molding Problems — Jose Navarro and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass. Presented by Mr. Navarro. Use of shell molding for production of low-carbon steel castings has been held back because of surface imperfections. These defects seem to be caused by gases evolved from the organic binder while the surface of the freezing metal is at a critical state of solidification. A second deterrent to use of the process has been the high cost of the resin.

The problem was studied from the standpoint of lowering mold cost, improving gating and risering technique and producing a more acceptable cast surface. Best results were obtained when the cavity was filled slowly.

Carbonate additions to sand-resin mixtures improved surface finish of plate castings up to ½-in. thick. Heavier sections further required that forsterite or zircon be substituted for the silica in the mixture. Sodium silicate was found to be an inexpensive and acceptable inorganic binder. It also solved the problem of producing an acceptable surface finish. Shells were made by blowing the mixture on a hot pattern, and drying rate was investigated for different pattern temperatures.

A Study of Some Factors Affecting Surface Drying of Steel Molding Sands — G. J. Vingas and A. H. Lewis, Dominion Engineering Works Ltd., Montreal, Canada. Presented by Mr. Lewis. Mr. Vingas now is associated with Wehr Steel Co., Milwaukee. Premature surface drying of green molds causes trouble in finishing the molds. It is especially noticeable in large molds which must

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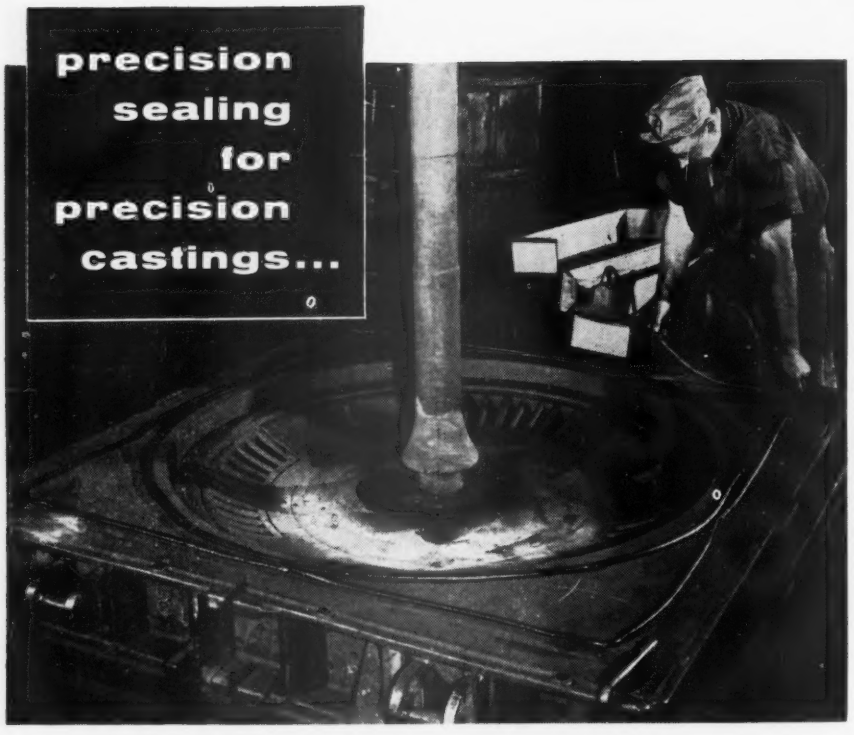

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remain open some length of time.

When bentonite-bonded sand reclaimed by a wet method was added to the green sand system instead of new sand, molders complained that the sand dried out too rapidly and was difficult to tool and finish. Addition of fuel oil or kerosene was tried without success. The problem was solved eventually by addition of suitable surface active agents to the sand mixture.

Conclusions: 1. The relative rates at which surface layers of bodies of different sands dry out are a function of the relative rates of migration of moisture in the sands, rather than of inherent differences in the evaporation rates. 2. Unfavorable drying out effects, notably in synthetic sands, and particularly when made with reclaimed sand, can be overcome by addition of anionic or cationic surface active agents, with a resulting over-all improvement to the sand. 3. Variations in the tendencies of various sands to dry out are attributed to hydrogen ions which may be present to a greater or lesser degree. Maintenance of a high pH in the sands minimizes the drying out tendency.

Bentonite — Properties and Composition and Their Relation to Casting Defects—William D. Emmett, Los Angeles Steel Castings Co., Los Angeles. Presented by B. G. Emmett, same company. For a study of sand erosion and pH control, making test castings gave positive results, but was too slow, time consuming and expensive. A test for erosion appeared to be a fine substitute for the casting test. In a variation of the Caine test, specimens are plunged into a riser that has been poured, causing a film of metal to solidify on the specimen. The specimen then is plunged into a ladle of hot metal and held until the film has melted. If the sand will erode, the specimen will show erosion on the surface. This test has been checked many times against the casting, and results are very similar. It reveals in a few minutes whether the sand mix is correct.

Conclusions: 1. Sodium carbonate in its concentrated form does not ionize. It should be added to the sand mix in a dissolved state. 2. A laboratory muller should not be used for experiments of this nature; no correlation is possible between a large muller and a laboratory muller. 3. The importance of molding sand pH is quite controversial. Experiments do not indicate that new sand with good bentonite can be improved by altering the pH factor. Good bentonite will test between 8 and 9

pH and has a settling test of not less than 20 sec. 4. Oven or skin dried molds should be closed and poured immediately, before they cool, to avoid erosion of the sand.

Gas Flushing of Molten Steel — Clyde Wyman, Burnside Steel Foundry Co., Chicago. This is a preliminary progress report of Steel Division Research Committee 9-C, of which Mr. Wyman is chairman. It represents a study of the effects on steel cleanliness of introducing gases and solid deoxidation products under pressure in the ladle.

In June, 1955, the committee agreed to make exploratory tests at Burnside Steel Foundry Co. to develop testing procedures. The study was to include flushing of molten steel with gases only, as well as with a combination with various special deoxidizing compounds. In this work, two phases were covered: 1. Gas injection was made in a 275-lb monorail ladle. 2. Injections were made in 5-ton teapot ladles. The experimental work utilized three methods of additions: A gas flush only; a gas flush in combination with a deoxidizer compound injection; and a manual deoxidation compound addition. Results of this work are detailed in the progress report.

During the coming year the research program will be continued with the assistance of various other co-operating foundries, which will inoculate production heats.

Ceramicast Process for Steel Casting—D. C. Ekey, research director, and E. G. Vogel, research engineer, Lebanon Steel Foundry, Lebanon, Pa. Presented by Mr. Vogel. In this process, a mixture of fine and coarse sillimanite, liquid hydrolyzed ethyl silicate and a liquid catalyst are mixed rapidly and poured over a prepared pattern. The mix sets in a few minutes as a gel and then as a rigid mold. During the gel stage, the mold is moderately flexible, facilitating stripping from the pattern.

After stripping, the mold is flamed with a torch, assembled, fired at a red heat in a furnace and is ready for pouring either while still hot or later, when cool, as requirements dictate.

The process has significant advantages for making medium and small steel castings, particularly those of complex design. Thin sections down to $\frac{1}{16}$-in. can be cast. Surface smoothness is exceptional—125-microinch finish and better is claimed. Tolerances of ± 0.003-in. per inch are possible where the measurements are made on parts cast wholly in the same section of the mold. An additional tolerance of 0.006 to 0.010 in. across the parting line must be accommodated.

Steel Roundtable Luncheon—Featured was a motion picture showing "Vacuum Degassing of Steel" at Bochumer Verein A. G., Bochum, Germany. It was the first American presentation of the English edition of the film. Remarkable photography in portions of the film taken at 1000 and 5500 frames per second add greatly to understanding of the German degassing technique.

Hydrogen content in steel is the cause of flaking during the cooling of forgings. Vacuum degassing is an effort to minimize the hydrogen content of the molten steel since vacuum melting furnaces are not available for heavy forging ingots of up to 150 tons.

The film describes stream-droplet degassing, in which the contents of a ladle are poured into a second ladle in vacuum, and vacuum ingot-casting, in which the ingot is cast in vacuum.

In stream-droplet degassing, an empty ladle is placed inside a vacuum chamber and the tapping ladle is placed air-tight on top of the chamber. The entry to the chamber is sealed by a sheet of aluminum which fuses under action of the molten steel. Pouring from one ladle to the other is at the rate of about 10 tons per minute. Since droplet dispersion exposes a large surface of molten steel, effective degassing can be accomplished even at relatively high pouring rates. After the vacuum treatment, the contents of the ladle are cast in air. In vacuum ingot casting, an ingot mold is used instead of a second ladle inside the vacuum chamber.

What's New With Snotters—This subject was the main discussion topic at the luncheon. It was brought out that snotters are amoeba-like craters of varying shapes in steel castings, with ceramic material in the craters. They range from the size of the head of a pin to that of a silver dollar, are of all colors, seem to have feelers, generally are shallow and act as hot spots. It is not a new defect, but one that is better recognized as a type.

Snotters seem to be influenced by oxides and oxidizing conditions in molds. Most green sand molds develop them, but they usually are disregarded. Some foundrymen call them ceramic-slag defects. Agitation of the metal gives better oxidation, which seems helpful in minimizing the defect. The discussion arrived at no solution for preventing snotters, but it was evident that interest in the subject is great enough that research already being conducted eventually should uncover the causes and suggest a remedy.

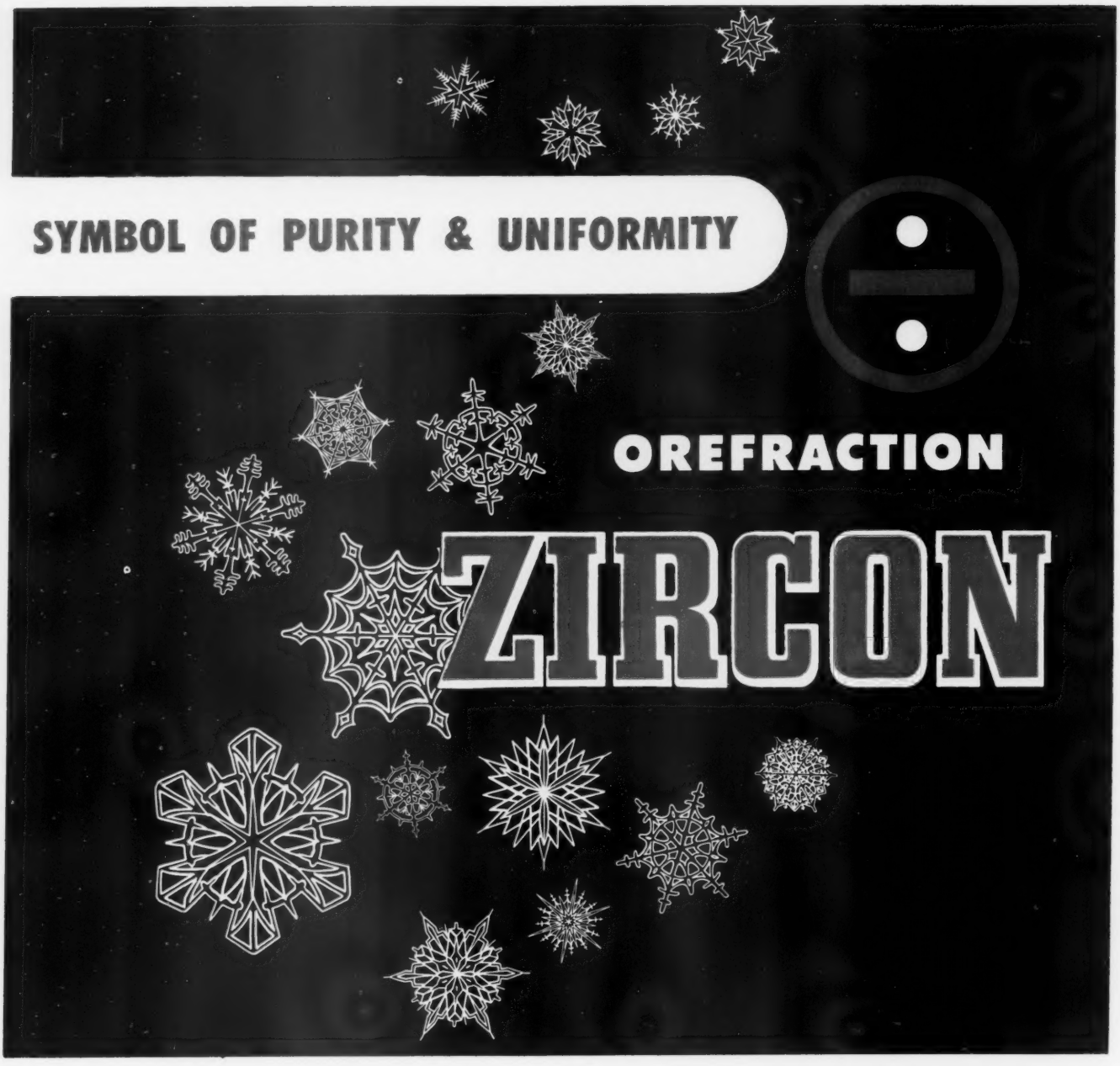
METALLOGRAPHY

TWO sessions on metallography for foundrymen covered such topics as general metallographic practice, management of a metallographic laboratory and the metallography of both ferrous and nonferrous metals. The society hopes to publish these papers in booklet form, as it did the nondestructive testing symposium presented at the Houston meeting in 1955.

Good Metallographic Practice—A. M. Montgomery, Aluminum Co. of America, Cleveland. The nature of the casting process prevents homogeneity in the microstructure of metals. Types of microscopic examination include studies of surfaces, fractures and machined surfaces. The part of a casting used should be free from defects in local sections. When samples are removed, care must be taken not to change the structure. Samples should be identified with indelible ink or waterproofing pens. They should be cleaned thoroughly. All distorted metal should be removed by grinding; the specimen should not become hot to the touch.

The next step is polishing, which is finer metal removal. Before each step, all prior abrasive should be removed. Insufficient polishing will not show the real structure; too much polishing exaggerates defects. Electrolytic polishing often can improve on mechanical polishing. Etching removes metal distorted by polishing and emphasizes structural features. Microscopic examination can show approximate rate of solidification, approximate composition, source of defects, results of heat treatment, etc.

Metallography of Aluminum and Its Alloys—L. F. Mondolfo, Illinois Institute of Technology, Chicago. In his presentation, Mr. Mondolfo showed slides of microstructures of representative aluminum alloys and discussed how they can help foundrymen to produce better castings. He explained what micrographs show about structure, composition, solidifi-



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cation, porosity, presence of iron, heat treatment, etc., at successively higher magnifications.

Metallography of Magnesium and Its Alloys — G. E. Holdeman, Dow Chemical Co., Midland, Mich. Metallography is valuable in measuring grain size, heat treatment, precipitation, etc. Samples must be representative—that is, from thick and thin sections, from under risers and from chilled and unchilled areas, for example. Generally, magnesium alloys can be cut with a hacksaw unless they are large. Then use a bandsaw followed by a hacksaw and grinding and polishing.

Low-melting point alloys should not be used to mount magnesium. Cold working should be removed during polishing. Beveled edges prevent tearing of polishing cloths. Specimens should be rotated counter to the direction of the wheel. Time successive polishings so as not to leave too many distortions or to expose constituents. Wash the specimen with water and alcohol, then air dry it. Some etching agents, such as picric acid, should not be stored because they change characteristics after a short time. Best policy is to make up small quantities.

Ferrous Metallographic Practice— P. C. Rosenthal, chairman, Department of Mining and Metallurgy, University of Wisconsin, Madison, Wis. In the production of ferrous castings, control tools are necessary to prevent straying in metal composition and physical properties. Like a good detective, a good operator uses more than one tool. Metallography is one of the oldest tools used by the metallurgist—it uses magnification to look at metal fractures and structures. The idea in using metallography is to control finished castings to meet

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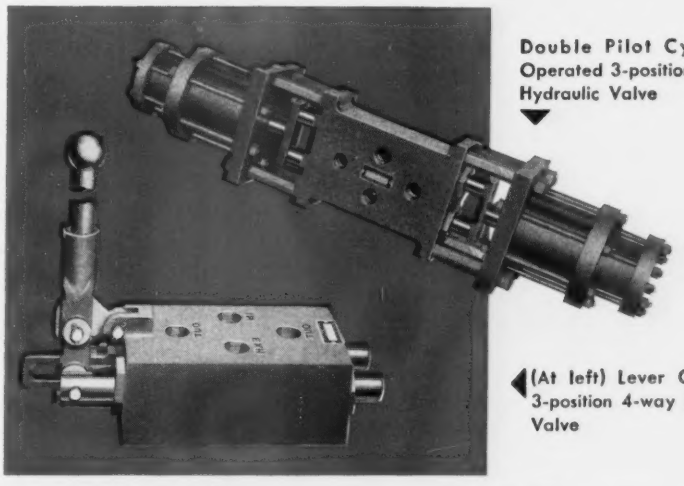

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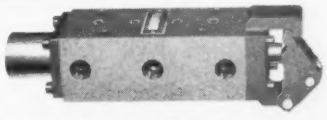

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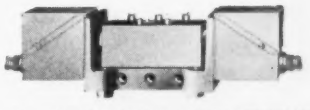

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specifications which are prescribed by the customers.

Among many slide illustrations were steel specimens in the as-poured state and after heat treatment. Metallographic examination affords a quick check as to whether structure is as it should be. It also reveals the presence and degree of inclusions, sulphides and other imperfections. Additional slides gave distinguishing characteristics of malleable iron and cast iron.

Metallography of Copper and Nickel-Base Alloys and Stainless Steels — J. J. Connelly, American Brake Shoe Co., Mahwah, N. J. Metallography is a near perfect tool. It reveals metal structure, and all mechanical properties are dependent upon structure. Today nonferrous foundrymen get orders for castings they have never made before, and to make them requires a lot of guesses on chemistry, molding practice, metal melting, etc. If a casting fails to meet the customer's specifications, the first step is to study the fractures by microscope. This gives a starting point for changes which can be made in chemistry, molding practice or melting, to achieve the objective.

Slides showed two aluminum bronze castings of almost identical chemical analysis. One showed good physical properties, the other not so good. The microscope showed the good casting had small grain size while the other had large grains. As result of such metallographic examination, processing can be controlled to get the required fine grain size.

Management of a Metallographic Laboratory—Walter W. Edens, research supervisor, Allis-Chalmers Mfg. Co., Milwaukee. Sole purpose of a metallographic laboratory is to provide a service—to provide information for making products. The laboratory serves various functions. It checks samples of incoming materials; it examines specimens submitted by manufacturing departments; and it engages directly or indirectly in research projects. All samples which are processed by the metallographic laboratory go through a control desk where they are coded and a complete record kept on them.

Equipment in a metallographic laboratory is varied as to types and makes and it will be as simple or as elaborate as the work to be done. Laboratory personnel is little different from that in other departments. All principles of management apply here as elsewhere.

GRAY IRON SHOP COURSE

TWO shop course sessions covered basic cupola operation, water-cooled cupola operation, acid cupola operation with water-cooled tuyeres and hot blast, and selection of materials for gray iron melting.

Basic Cupola Operation—Sam F. Carter, American Cast Iron Pipe Co., Birmingham. Mr. Carter traced the origin and reviewed the development of the basic cupola with comments upon its principles of operation, advantages and disadvantages. Slides and charts were shown analyzing acid and basic slags and showing a comparison of acid and basic operations to arrive at same final metal chemistry. Also discussed was the effect of flux on slags and the need for rigid slag control on highly basic operations. Mildly basic cupolas generally offer no real problems. Large basic furnaces melt much slower, generally, than do large acid cupolas. Mildly basic slag is extremely fluid. Metal properties of controlled basic iron are excellent. Basic refractory cost is about twice that of acid. Additions of flux to the melt are not conducive to saving coke.

Water-Cooled Cupola Operation—M. H. Horton, Deere & Co., Moline, Ill. Mr. Horton has had several years experience with the water-cooled cupola and he presented a series of slides showing a variety of techniques used in water cooling. Water cooling saves shells, increases the melting rate, decreases refractory costs, reduces cupola maintenance, provides better over-all control throughout the day, gives better control over slag and prevents burnout at the well. Following installation of water-cooled cupolas at the speaker's foundry, tonnage increased about 50 per cent. Cooling water is pumped from a nearby river at 50-60 gpm and average temperature rise of water in use is 12 degrees.

High-temperature rubber spray rings around the cupola shell disperse water uniformly and provide uniform melting rate and uniform melting diameter inside the cupola. Cupolas are held in operation for three days, being banked at night. There is no evident bridging inside the cupola.

Acid Cupola Operation with Water-Cooled Tuyeres and Hot Blast—H. E. Henderson, Lynchburg Foundry Co., Lynchburg, Va. Mr. Henderson discussed the techniques used in operating continuous tapping, front slagging cupolas lined to 48 in. ID with an acid monolithic blown refractory. Gray iron is tapped at 2900 to 2950°F and ductile iron is tapped at a minimum of 2900°F, with 2950°F preferred. Cupolas are equipped with a continuous desulphurizing basin, hot blast, air-weight controls and fly ash collectors. Cast copper tuyeres protrude 9 in. inside the cupola lining and are tilted downward at about a 12-degree angle. An automatically controlled cooling system circulates water through each tuyere.

Discussion—High tapping temperatures are required because of metal treatment before pouring. Sulphur content in the melt is reduced by injecting calcium carbide carried in a stream of nitrogen gas. Metal temperature drops to about 2620°F during the treatment. Practice dictates never to pour ductile iron at less than 2550°F. Protruding tuyeres are slanted downward to keep the blast directed toward the well to provide the temperatures needed. Tuyere arrangement reduces burnout. No washout occurs between tuyeres but burnout occurs 10 to 16 in. above the tuyeres. Three sets of tuyeres have been used in two years of operation. Coke used is 4 x 6 in., unscreened. One foundryman indicated he had received four years of service from steel tuyeres mounted flush with the inside of the melt zone lining rather than extending them inside.

Selection of Materials for Gray Iron Melting—R. A. Clark, Electro Metallurgical Co. Division, Union Carbide & Carbon Corp., Detroit. The cupola is the most effective melting furnace in existence and is economical to operate. A wide choice of materials is available for melting, the principal ones being pig iron, foundry returns and cast iron and steel scrap. The choice depends on analysis wanted in the iron and economic conditions which control availability and relative prices of the various materials.

Pig iron constitutes the bulk of the charge because it has known chemical content and thus provides a good backbone. Carbon is influential in cupola iron and pig is used frequently to get this carbon. The higher the silicon in the pig, the lower the carbon. High phosphorus in pig iron improves fluidity. Foundry returns—sprues, gates and runners

—also are of known analysis and with the pig iron make up about 60 per cent of the cupola charge.

To this base, usual practice is to add scrap in one or more of several forms. Analysis of scrap is not known specifically, but it is possible to make a rough estimate of chemical content by charging definite proportions of given grades. If scrap is charged indiscriminately, chemistry can be upset. The alloy content in scrap may be an advantage to the maker of high-strength cast iron, but a disadvantage to others. Use of borings and turnings is fairly common practice, but it may be wasteful if the cupola blast is so high that the material is blown out.

The metal melted in the cupola is brought to its final chemistry by adding desired amounts of alloy briquets, such as ferrosilicon and ferromanganese. They can be put into the cupola charge or introduced as ladle additions.

Through the use of such briquets as a ladle additive, a base iron can be modified to meet varying specifications in casting runs. The point to remember in making ladle additions is to add the material slowly and to use some system of measuring.

NOISE CONTROL

TWO sessions—one a roundtable luncheon—were devoted to the subject of noise control. Discussion covered the mechanics of hearing loss and means of correcting foundry noises, as well as the legal aspects of the problem.

Compensation Trends in Loss of Hearing—Floyd E. Frazier, National Association of Mutual Casualty Companies, Chicago. Court decisions in Wisconsin and New York held that compensation is payable for hearing impairment even though no loss of earnings is involved. In both states, however, payment is deferred for six months, during which time the worker must be absent from the injurious noise so that the extent of permanent hearing loss can be determined.

The tendency in most other states has been to await the results of legislative action and test litigation in New York and Wisconsin. In some states compensation is barred unless hearing loss is total or unless earning capacity is impaired. In others there has been no test litigation to determine whether loss of hearing due to noise is compensable. The entire subject, consequently, is in a state of flux.

Because, in the absence of adequate past records, it is impossible to determine what portions of hearing loss are due to present and past employments and to occupational and nonoccupational factors, it is essential that industry not only take steps to control noise as much as possible but also to maintain adequate medical records. Such records should include pre-employment tests and periodic audiometric retests so that the origin of hearing losses may be established.

Foundry Noise Control—A Demonstration—Walter Konn, General Motors Corp., Detroit. The effectiveness of air intake and exhaust mufflers and acoustical enclosures in reducing noise was demonstrated. Impact noise of falling castings can be reduced by spot welding a piece of sheet or plate steel onto the steel surface of a chute, pan conveyor or tote box into which castings fall.

Typical Foundry Noise Exposures—Edward G. Meiter, Employers Mutual Liability Insurance Co. of Wisconsin, Milwaukee. Noise is measured in decibels—the higher the decibel number the louder the noise. A whisper measures 20 db; airplane noise measures 120 db. Decibels measure noise intensity (loudness), but frequency (pitch) also has an important effect on hearing. High-frequency noise is more harmful than noise of low frequency, but the limits of noise levels as to harmful effects is not known.

An over-all noise level of 120 or more decibels is harmful to hearing. Some ears, however, can be damaged by 90 to 120 db sound. Continuous noise is more damaging than occasional high noises.

Various foundry noises differ in intensity and frequency and should be considered separately in any noise reduction program.

The Mechanics of Hearing and Hearing Loss in Noise Deafness—Abraham S. Goldner, M. D., Flushing, N. Y. Dr. Goldner described the inner ear and its function. He discussed the effect of noise and other adverse influences on hearing ability.

Short Case Histories in Foundry Noise Control—A. L. Cudworth, Liberty Mutual Insurance Co. The placement of cardboard covered with sheet metal on the bottoms of tote boxes, on metal tables or in chutes reduces noise considerably.

James Botsford, Bethlehem Steel Co., Bethlehem, Pa.—To dampen vibration and thus reduce noise during the chipping of ship propellers, C-clamps were screwed onto the propeller blades. The method was very effective in reducing noise in the cleaning room.

E. L. Lund, Allis-Chalmers Mfg. Co., LaCrosse, Wis.—Noise level in the cleaning room was reduced by putting wooden panels sprayed with a sound-proofing material in front of tumbling barrels and mounting the barrels on vibration dampers. Also the skip hoist which feeds the centrifugal blast tumbling machine was lined with layers of hard wood, soft wood and sheet metal. Acoustical

Large crowds were the order of the day at many of the technical sessions

boards hung vertically from the ceiling form boxlike cubicles to deaden noise.

The results of the soundproofing program have been a comparatively quiet cleaning room and, as a result, both improved worker morale and production.

CORE and MOLDING SAND

SIX sessions and a dinner meeting were included in the Sand Division program. Subjects covered ranged from analyses of core and molding sand testing to the development of new types of specimens, cold coating of shell molding sand, CO_2 process sand, surface finishes and many other sand topics.

Evaluating Cereal Core Binders—E. C. Zuppan and H. Putz, Oliver Corp., South Bend, Ind. Tests were run on the ability of core specimens to resist sagging or dropping of overhang during "jolt testing." Blown specimens were made with two samples each of 11 corn cereal binders from eight mills. The test for ability to support overhang was decided to be more sensitive and useful than tests for ability to resist sagging in handling or cracking and spreading.

A testable difference in cereals was determined, including differences in cereals from the same mills. Viscosity tests of the cereals gave results which paralleled the overhang tests. In tests made with core oils, it was found that they also affect the jolt overhang strength. Some relation to viscosity seemed to occur, but best results obtained were with one of the thinnest oils tested.

Some Considerations on the Tensile and Transverse Strength Testing of Shell Mold and Core Sands—P. J. Ahearn, F. Quigley and J. I. Bluhm, Watertown Arsenal, Watertown, Mass., and J. F. Wallace, Case Institute of Technology, Cleveland. Because of difficulty with reproducibility of baked specimen tensile test results, an investigation was made to develop tensile tests for baked oil or resin-bonded sands that would more nearly comply with stress analysis requirements for accurate testing. Both the briquet tensile and transverse bend tests were studied.

A new tensile briquet was designed in which stress concentration did not significantly influence tensile strength. Also, a clip of hardened steel was placed around each end of the standard specimen so that the grip would bear on the outside surface of the clip rather than cut directly into the side of the briquet.

The new design demonstrated higher tensile strength with all sands tested and better reproducibility in the case of rammed resin and oil-bonded sands. Use of steel clips on the standard briquet slightly improves the strength of dumped shell mold specimens, but does not affect the tensile testing of rammed resin or oil-bonded briquets. In experiments on transverse testing, utilization of large radius supports for load application slightly improves the strength and uniformity of the results with dumped shell mold sands, but has negligible influence on the data from standard baked core transverse tests.

View shows part of the audience at the first of two metallography sessions. Proceedings will be issued at some future time as a separate publication

Some Observations on the Transverse Test at Elevated Temperatures for Molded Sand Mixtures—D. C. Williams, Ohio State University, Columbus, O. Test specimens 1 x 1 x 8 in. were molded using three sand mixtures: 1. 4 per cent western bentonite and 96 per cent New Jersey No. 90 sand. 2. 4 per cent western bentonite, 10 per cent silica flour and 86 per cent New Jersey No. 90 sand. 3. 4 per cent western bentonite, 1 per cent corn flour and 95 per cent New Jersey No. 90 sand. All contained 4 per cent moisture, and all specimens were dried at 212°F for two hours. Specimens were broken with the transverse accessory affixed to a sand strength machine.

Specimens molded from mixtures 1 and 2 showed a slightly higher modulus of rupture for the average top face of the specimen than the averages for the other faces. This result indicates that a core which fails when placed in a mold in one position might prove satisfactory if rotated 90 or 180 degrees.

In tests of transverse properties at elevated temperatures, it was not possible to obtain transverse test values at temperature levels as low as 1600°F because many test specimens ruptured or deflected because of their own weight before the completion of the 20-minute heat soaking period. Test specimens molded from the bentonite and silica sand maintained excellent rigidity up to rupture, when they broke into two approximately equal parts. Test specimens molded from the corn flour mixture (3) deflected markedly before breaking.

Specimens made from a 1.5 per cent core oil and 98.5 per cent sand mixture were submitted to thermal shock at 2500°F. They began to deflect in 30 seconds and continued to do so until they reached the furnace floor, 1 in. below, but showed little or no cracking on their surfaces. This behavior may be a clue to the sagging of cores in castings.

Does Sand Testing Give Us the Facts?—R. W. Heine, University of Wisconsin, Madison, Wis., E. H. King and J. S. Schumacher, Hill & Griffith Co., Cincinnati. Presented by Prof. Heine. Investigation of mold hardness indicates that use of 2 and 4-lb weights with a 2-in. drop provides the best correlation between laboratory test data and results obtained on jolt machines in the foundry. The usual 14-lb, 2-in. drop serves as a useful means for comparing sand properties at high density, a condition not usually attained in jolting.

New Test for Better Molding Prac-

tice—R. W. Heine, University of Wisconsin, Madison, Wis., E. H. King and J. S. Schumacher, Hill & Griffith Co., Cincinnati. Presented by Prof. Heine. Test uses 2-in.-diam tube 12 in. long with one end sealed in a cup. The tube rests on a steel block 2 x 4¼ x 4¾ in. This assembly is placed on a jolt machine, the tube filled with sand to be tested and given a series of jolts. Hardness and sand height in the tube are measured at 5, 10, 15, 20, 30 and 40 jolts. Through these measurements the test is claimed to reveal effects of sand type, moisture content and additives, or jolt compactibility or flowability. Through use of the previously mentioned light-ram test, the results may be correlated with green sand properties.

Molding Sands, Molding Methods and Casting Dimensions — R. W. Heine, University of Wisconsin, Madison, Wis. Discusses effect of density of green sand, jolting and squeezing in obtaining castings with close dimensional tolerances. Briefly the sand should possess reasonably high initial density over 60 lb per cu ft, and have an optimum response to jolting and squeezing so that final density, hardness and strength can be reached readily.

Mold hardness of over 90 is suggested, with a green strength of 16 to 20 psi. Sand should be molded at the lowest possible moisture content. Patterns must be of good quality and kept in good condition. Current molding machines used at correct capacity serve satisfactorily. Overloading machines results in oversize and overweight castings.

Cold Process for Resin-Coated Foundry Sands—J. E. Bolt, General Electric Co., Pittsfield, Mass. Resin-coated sands make possible blowing of shell molds and cores without

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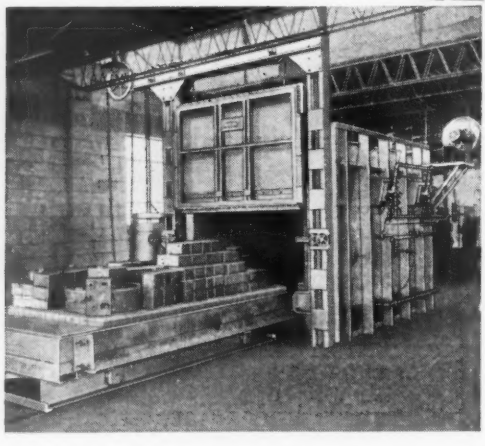

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resin segregation. Cold coating may be accomplished by either of two methods. Either a liquid resin is added to dry sand and distributed over it, or a dry, powdered resin is mixed with dry sand and then dispersed by a solvent, which usually is a mixture of alcohol and water. Round grains of sand require less resin, but have a tendency to thermal cracking. A subangular grain with a good screen distribution and a higher percentage of resin often is preferable. Coating may be done in a variety of types of mullers, but high and low-speed mulling require different procedures.

Discussion—Lou G. Pedicini, General Motors Corp., Detroit, commented that he sees few jobs in which shell cores can replace the oil-bonded type at a reduction in cost. Mr. Bolt said that the process still is new, but is spreading. Lightweight cores cut costs, reduce work on complex cores and give good surfaces.

Developments of High Pressure Molding with CO_2 Process Sands—T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago. Nature of the high-pressure, diaphragm molding process is such that it can be combined very easily with the CO_2 process. CO_2 process sand can be placed in a mold, by hand, at any points which are critical or where a particularly good surface is required. During squeezing, that sand will not move, other than to compress to the same hardness as the rest of the mold. Gassing is done through vents in the pattern, while the mold is in the flask. Similarly, an entire mold can be made of CO_2 process sand.

Discussion—Asked where CO_2 sand might be used as facing, Mr. Barlow cited, as an example, any place where a draw could not be made in green sand. Questioned as to the effect of soda ash on the sand heap, he replied that no one knows certainly what happens, but, in any event, sand used as facing comes out of shakeout as a corebutt.

Factors Affecting Core Stickiness (Progress Report of Sand Division Committee 8-c-f)—Presented by Don Mills, General Motors Corp., Saginaw, Mich. The committee's goal was to devise means of measuring stickiness in core sands. The first report was reported last year and is available in the 1955 AFS *Transactions*. In current group of tests, the goal was to determine the value of measuring sand retained on corebox patterns.

The core sand mix used contained

0.2 per cent bentonite, 1.25 per cent cereal, 8-10 per cent core oil and, variously, 1½, 2½ and 3½ per cent water. One factor was varied at a time, and 20 cores were made per test. After each fifth core, sticking sand was brushed out and weighed in an analytical balance. Concentrations occurred under blowholes. When water was varied, best results were obtained with 1½ per cent. With 2½ and 3½ per cent, stickiness was high for 10 cores or so, but decreased rapidly until best results of all were obtained after 17 or 18 had been blown.

When oils were varied, a similar pattern of increasing and decreasing stickiness occurred, and stickiness seemed to vary with volatility of the oils used: More volatility, more stickiness. The test seems to be able to pick up small differences in stickiness, and results of laboratory and production tests correlated.

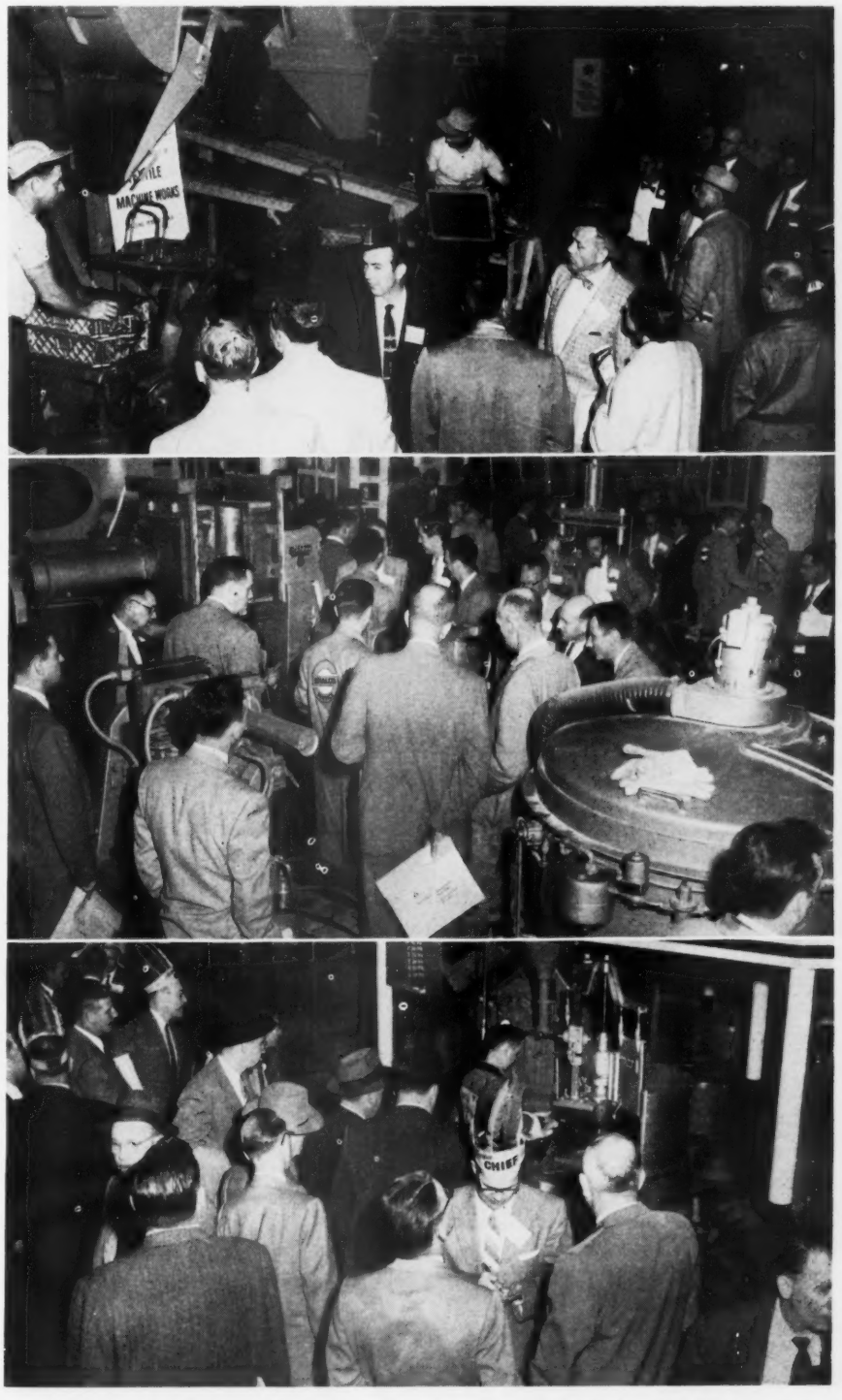
Discussion—Elmer Zirzow, Werner G. Smith Co., Cleveland, noted that the tests concerned only one of the three types of core stickiness. Others involve chunks of cores and rough cores caused by grains turned on end. J. E. Bolt, General Electric Co., Pittsfield, Mass., commented that when resin sand is used, the corebox runs sticky for a day or so, then presents less of a problem. Stickiness also occurs for a while when core oils are changed.

New Developments in Core Blowing—Arthur M. Clark, Ford Motor Co., Dearborn, Mich. Presented at the Sand Division dinner. Beginning with a short historical resume, various types of core blowers from small bench type to those capable of producing cores up to 375 lb or larger were described briefly. Basically the core blower operates on the principle of air carrying sand at high velocity. For satisfactory results the magazine should be larger at the bottom than at the top to avoid channeling of air. Agitation of sand in the magazine also prevents channeling. Proper compacting of sand in the corebox is accomplished by suitable location of blow tubes in the magazine plate and vents in the box. A double plate on the magazine containing both blowholes and vents operates satisfactorily.

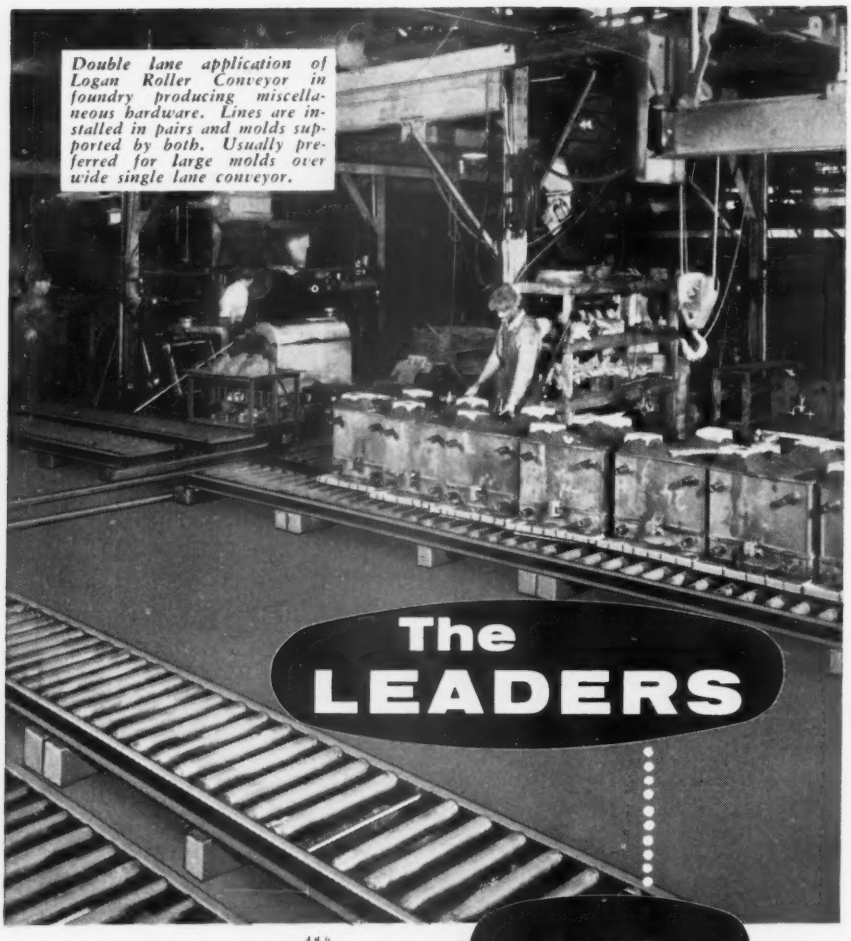
Green Sand Casting Finish—R. F. Meader, Whitin Machine Works, Whitinsville, Mass. Competition may force green sand foundrymen to produce better casting finish. Shell molding and die casting have taken away some choice squeezer jobs for two reasons: Better surface appearance and dimensional tolerances. In green sand, castings made with better surface finish also are truer to the patterns. Many of the same factors governing finish also exert strong influence on dimensional accuracy. The most important factor governing surface finish is grain size of the sand—the finer the grains, the smoother the finish, within certain limits.

Grain distribution of sand also is an important factor. Other factors include mold hardness, molten metal temperature, use of facing additives, flowability of sand, condition of pattern equipment, sand preparation and others.

Statistical Techniques for Classifying Foundry Sands—D. C. Ekey and John Leaman, Lebanon Steel Foundry, Lebanon, Pa. Presented by Mr. Leaman. Classification of sand always is a problem. The commonly used AFS grain fineness number system is not completely satisfactory because two very different sands can have the same fineness number. The cumulative curve and test tube classifications also are limited and possess many flaws. Specifying



Operating molding exhibits attracted the attention of the 13,000 visitors



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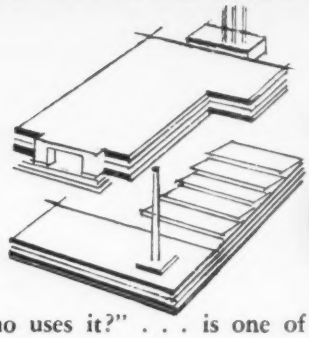

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grain fineness number on sieves only amounts to patching a poor system. A good method should give the distribution, use the same testing equipment now employed, be easily described and interpreted, be usable without understanding and should be good for both foundry and research purposes. It should show the "central tendency" of sands. Statistical methods can give the answers.

The system developed by the authors is based on a formula embracing three factors—standard deviation (measure of dispersion), skewness (deviation from normal distribution) and peak of distribution. It can be used with 50-gram samples.

Analysis of Factors Affecting Surface Finish of Gray Iron Castings—D. C. Ekey and R. L. Yard, Lebanon Steel Foundry, Lebanon, Pa. Presented by Mr. Yard. The importance of good surface finish is common knowledge; search for it has led to development of shell molding, investment casting, ceramic and glass powder molding, among others. Green sand molding also can do a good job, however, and statistical analysis techniques can be of help. They should use an interaction of variables, not the traditional method in which one constant is varied at a time. Experiments have shown that tests on surface finish can be run quickly and will yield accurate results, with statistical analysis techniques.

Coremaking With CO_2 Process — Frank M. Scaggs, Oklahoma Steel Castings Co. Inc., Tulsa, Okla. Sand mix composed of 200 lb AFS 55 fineness sand, 100 lb AFS 100 fineness sand, 15 lb proprietary silicate binder, 2 lb cereal and 2 lb iron oxide is employed to produce 8½ tons or 60 per cent of core production. Cores are made on the bench, by blowing, and by ramming. Largest core weighed about 65 lb. Presently about 2 oz CO_2 gas per pound of compounded sand is used for curing, but with increasing knowledge of gassing time and pressure, a reduction is expected.

The Carbon Dioxide Process—D. V. Atterton, Foundry Services Ltd., Birmingham, England. (Official exchange paper of the Institute of British Foundrymen.) Compendium of information includes discussion of advantages and limitations, theory and chemical reactions, preparation and properties of CO_2 sands, methods of gas application, and illustrated resume of actual foundry applications.

With fine sands the special silicate binder requirements are 5 to 7 per

cent while with coarse sands they may be 2 to 3 per cent. With average core and molding sands the usual binder addition is 4 per cent. In some cases additions of seacoal, pelleted pitch, wood flour, etc., are made to provide better collapsibility, particularly for iron and copper-base alloys. Additionally cores may be coated with volatile-type washes for obtaining smoother surfaces. Overgassing as indicated by appearance of whitish deposits on the surface of the core usually results in a weak, friable product.

Discussion—Replying to questions the authors stated that chills can be placed in cores and molds without trouble. Cylinder gas appears more economical than use of bulk dry ice, and supplies the gas immediately. Cores may be kept in storage for several days without trouble, but they should not be left standing in green sand molds too long as they tend to pick up moisture.

For gray iron castings with ⅛-in. section the silicate binder should be held to the minimum and seacoal added. For heavy sections seacoal provides better collapsibility, and mention was made of a casting with 16-in. section in which 2 per cent pelleted pitch was added to the core sand, and the core well blacked.

Report of Core Test Committee (8-C)—Presented by James Huss, Lauhoff Grain Co., Danville, Ill. Replies to questionnaire relative to the CO_2 process indicate a wide range of application with good tolerances obtained. Various methods are employed, using 2¾ to 6 per cent silicate binder; gassing time and amount of CO_2 used also varied widely. Gas use ranged from 1 to 8 to 1 to 120 by weight. Additives for promoting collapsibility include asphalt, wood flour, cereal, gilsonite, graphite and seacoal, while those for improving finish include gilsonite, graphite, iron oxide, seacoal and silica flour.

Influence of Sand Distribution and Surface Coatings on Metal Penetration (Report of Mold Surface Committee 8-H.)—Presented by C. C. Sigerfoos, Michigan State University, East Lansing, Mich., and J. A. Ridderhof, F. B. Stevens Co., Detroit. Mr. Sigerfoos discussed the molding phases of the tests and Mr. Ridderhof the sands, washes and results.

In the tests the standard Gertsman method in which 1⅛-in.-diam cores 2 in. high are surrounded by molten iron in a cavity 6 in. in diam and 5 in. high with a riser 15 in. high was used; also a modified test was used in which the cores were mounted on a vented arbor 20 in. high and sur-

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rounded by molten iron to the top. Joints between the cores were sealed. One-half of each core in both tests is coated with one of three washes containing silica flour, Mexican graphite or crystalline graphite. The core sand was a special blend designed to give certain grain distribution characteristics which would provide differences in pore diameters of the surface voids ranging from coarse to fine.

Results indicate that silica flour wash provides the best protection against penetration in both the standard and modified tests. In the standard test Mexican graphite wash was good and crystalline graphite poor while in the modified test neither was consistently better than the other. Sand grain distribution which gave the finest pore size resisted penetration best.

Casting Finish, Precision and Tolerance—Clyde A. Sanders, American Colloid Co., Chicago. A common tendency is to use the word "dirt" to define all surface defects. However, such defects must be identified as to cause if remedies are to be applied. Some of these causes are cutting and washing of sand, soft ramming, rubbing or breaking of parts of mold or core during closing, etc. Hence, when the cause is identified, proper remedy can be applied.

SAND SHOP COURSE

SAND shop course discussions were divided into two sessions, covering practical application of knowledge on sand conditioning and mixing.

What Sand Mixture Shall I Use?—Panel members: H. W. Meyer, General Steel Castings Corp., Granite City, Ill.; R. F. Meader, Whitin Machine Works, Whitinsville, Mass., and W. G. Parker, General Electric Co., Elmira, N. Y. Discussion centered on sand and mold characteristics which affect casting tolerance and surface finish. Influencing factors are deformation, flowability, amount of carbonaceous material in the sand, condition of molding equipment and the effect of mulling.

Mullers should be kept in good condition, and mixing techniques and mixing times should be adjusted according to the type of muller used. Reclaimed sand may be handled almost like new sand. It produces the same quality casting finish as does new sand.

Topic of concluding sand shop course was **Eliminating Sand Pile Blues.** Clyde A. Sanders, American Colloid Co., Chicago, was moderator and Ray Olson, Shell Process Inc., Chicopee, Mass., Charles W. Mooney, Link-Belt Co., Philadelphia, and Edward H. Berry, Dodge Steel Co., Philadelphia, were panel members.

Consensus was that production requirements and desired tolerances influence choice of equipment, patterns and molding methods. For close tolerances good supervision as well as good equipment maintained in first-class shape are essential. Molding materials should be selected to provide desired results and controls should be set up to see that they remain within the desired limits.

Proper gating is a necessity to eliminate dirt, turbulence, etc. Fineness of sand must be tied in with moisture, binders and additives as well as proper mixing. Sand should be controlled to definite characteristics and mold hardness.

PATTERNMAKING

EPOXY resin patterns, new developments of the industry, metal patterns and coreboxes with metal dryers were considered at two technical sessions and a roundtable luncheon sponsored by the Pattern Division.

Use of Epoxy Resin as Pattern Material—E. J. McAfee, Puget Sound Naval Shipyard, Bremerton, Wash. Three methods of making epoxy resin patterns were described. Preparation of the mold in each case was identical. A master pattern, required to make the mold for the plastic pattern, is treated with glycerine and sprayed with a low-melting point alloy. Gypsum plaster is poured to height of the mold frame, and withdrawn when plaster has set. Mold surface is smoothed with steel wool and two coats of a parting agent separated by a coat of wax are applied. Mold is then ready for pouring of the resin.

For patterns of varying shapes and volumes but limited dimensions, casting resin is poured around a wood core plug, held down in the plaster mold. For plaques or flat patterns, epoxy casting resin combined with an aluminum filler is used. In the third method, used for dies and jigs, three coats of die-facing epoxy resin are applied on the mold, and small sections of glasscloth are placed over the surface and overlapped, with the resin soaking through the fibres. After this has thoroughly air cured, the cavity in the pattern is filled with a backing material consisting of polystyrene beads with a suitable hardener.

Discussion—Question of allergy to the resins was raised. A new line of low toxic materials overcomes the dermatitis feature formerly present in some cases. Advantages of the epoxy resins lie in their ability to cure at normal room temperatures, eliminating the need for special ovens or curing equipment, their dimensional stability and high impact strength.

Opportunities and New Developments of the Patternmaking Industry—M. K. Young, U. S. Gypsum Co., Chicago. Many metal castings and stampings are being replaced by high-strength plastic materials, and patternmakers have utilized their experience and background in making foundry patterns to apply new techniques and materials to broaden the field of patternmaking. Introduction of epoxy resins provided a patternmaking material ideal for reproduction of master patterns and models. Vacuum forming of sheet plastics was described. Use of gypsum cements and plastic resins in production of sports cars and boats has opened a new market for the pattern industry. With these materials original patterns and models can be made in much less time than is required by traditional patternmaking methods.

Discussion—Progress has been made in using plastics alone and in combination with metal for matchplates, coreboxes, dies, jigs and fixtures with a saving in materials, time and manpower.

Metal Patterns and Coreboxes with Metal Dryers—O. C. Bueg, Arrow Pattern & Engineering Co., Erie, Pa. In making patterns for foundries, patternmakers should consider the type and number of castings desired, molding and coremaking problems and the type of molding machine on which the pattern is to be used. As members of the foundry industry, patternmakers should keep informed on new developments, including shell molding, high-pressure molding, the CO_2 process and the use of epoxy resin for production patterns.

Ralph L. Lee, Birmingham, Mich., addressed the pattern roundtable luncheon meeting. His subject was

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"For 14 years, people have been trying to show us what they felt was a better core oil," says Ralph Melick, Core Room Supervisor of Clio Foundry, Inc.

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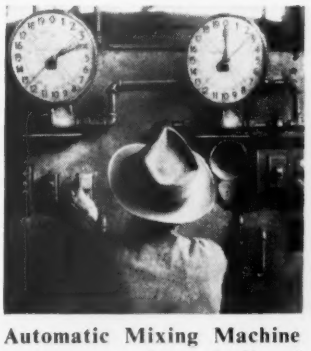

Automatic Mixing Machine meters every drop of oil and water used to prepare sand for cores. Clio also uses electronically controlled gas ovens; has boosted daily melting capacity from 1 to 50 tons since 1940.

Core and Casting—another job well done. Clio makes numerous types of castings, including "high pressure" castings for the agricultural and automotive fields. They use Cities Service Core Oil exclusively.

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Patternmaking—Man to Man. Patternmakers should give more attention to public relations with the rest of the foundry industry—with designers and foundrymen. Furthermore, patternmakers would be happier producing patterns with the thought of the finished cast part in mind rather than working only for the hourly wage.

SAFETY and HYGIENE

FOUNDRYMEN concerned with ventilation and safety problems heard three papers on the subject and saw two English motion pictures devoted to dust control on pedestal and swing frame grinders.

Foundry Ventilation—J. G. Liskow, American Air Filter Co., Louisville, Ky.—An estimated $25 million will be spent for foundry ventilation in 1956. Ventilation and dust control accomplishes more than just improved working conditions. It can reduce the need for extremely tight seals to keep contaminants out of the working parts of equipment. Thus equipment cost can be reduced. Maintenance cost also is lessened.

Catching cupola fly ash reduces roof cleaning cost and eliminates law suits from neighbors. Proper dust control and ventilation reduce labor turnover, improve productivity, lessen compensation suits and lower insurance costs.

Aluminum Therapy — Dr. J. W. G. Hannon, McIntyre Research Foundation, Washington, Pa. The first preventive of silicosis is by dust control. Medical control is second, and aluminum therapy is the third treatment. It takes care of dust that cannot be removed by mechanical means. Aluminum therapy should be used only after dust control and medical treatment have proved ineffective.

The chemical action of silica, not the physical action, kills body cells and causes silicosis. Treatment with aluminum prevents and arrests the condition but does not cure it. The treatment is not harmful to the lungs and does not aggravate tubercular cases.

Aluminum therapy involves inhilation into the lungs of air-borne particles consisting of 15 per cent aluminum coated with an active oxide making up 85 per cent of the one-micron size particles. Intake to the lungs may be through hoses or by spraying the particles into an area such as a locker room where workers change clothes. Particle concentration in the air is about 1 gram of powder per 1000 cu ft of room space.

Aluminum performs its work by coating the silica dust in a worker's lungs, thus preventing action of the silica with body cells.

Dust Control on Pedestal Grinders and **Dust Control on Swing Frame Grinders.** These two British Steel Castings Research Association films show research work done on grinder dust control. Results indicate that an integral dust control system built on a grinder or a combination integral control system and exhaust booth do the best job of keeping grinding dust from escaping into the general foundry atmosphere.

AFS Safety Training Course—H. J. Weber, director, Safety, Hygiene and Air Pollution Control, AFS. Training seminars on safety, hygiene, dust control and ventilation are to be conducted at universities in various AFS chapter areas. More information on these seminars will be released by the AFS in the future.

MALLEABLE SHOP COURSE

THE SINGLE malleable shop course session was devoted to molding methods for malleable iron and was attended by an overflow crowd. Molding methods covered included green sand, dry core sand, mold blowing, high-pressure and shell.

Green Sand Molding—W. Tragarz, International Harvester Co., Chicago. Demands of engineers for complex castings true to patterns heralded development of molding machines and decline of hand ramming of patterns. Although molders were skilled workers, molding machines cut average weights of castings, saving metal and machining. Green sand molding can be adapted to any form of pattern or to mechanization and automation and with care can achieve close tolerances. It is a flexible method, and sand is reusable.

Dry Core Sand Molding — R. H. Greenlee, Auto Specialties Mfg. Co., St. Joseph, Mich. This method is used primarily for steel, rather than malleable. It employs conventional core sand mixes. At this shop, parts are hand rammed, baked, definned and coated with a core wash to help collapsibility and prevent erosion. It uses the cope and drag stack molding technique, with vertical pouring of joined halves. Castings can be made to close tolerances, halfway between green sand and shell molding. Shrinkage, blows and misruns are minimized, and molds are uniformly hard. Higher cost is the only drawback, but some castings cannot be produced by any other method. The sand is not recoverable.

Mold Blowing — Medie Hakeman, John Deere Malleable Works, East Moline, Ill. The author's company uses this method, which is similar to coreblowing, in conjunction with stack molding. Stacks are built ten molds high. The drag pattern plate is in the blowplate and has provisions for four patterns and the sprue cutter. The cope pattern plate is in the bottom. Molding time and sand used have been cut in half. For good results, this method should be used with jobs involving a good-sized production run. Sand used is the same as that employed in other molding machines.

High-Pressure Molding—Tom Barlow, Eastern Clay Products Dept., International Minerals & Chemical Co., Chicago. High-pressure molding is essentially green sand molding and can be a very high production method. It produces a rigid, dense, uniform mold capable of close-tolerance casting. Weight of casting is held to minimum because mold wall movement is prevented. CO_2-process sand can be used in the operation either as a facing sand where accuracy is vital or for an entire mold. Gassing is done in the flask. CO_2-process sand can be applied by hand where needed and will not shift during mold squeezing. CO_2 has no effect on green sand in the mold.

Shell Molding—C. F. Joseph, Central Foundry Division, General Motors Corp., Saginaw, Mich. Shell molding has revolutionized the foundry industry. It has done more for the industry in five years than anything else in history. The process offers these advantages: Less material cost, easy mechanization, unskilled labor, better working conditions, storage of molds, reduced cleaning costs, cheaper castings, lighter castings, better control and lower scrap rate.

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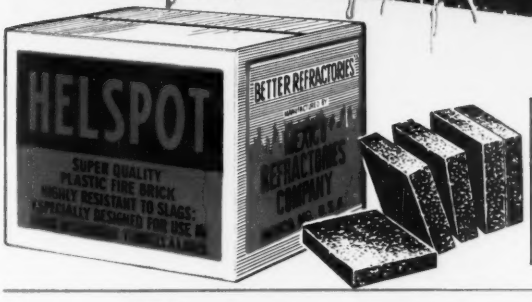

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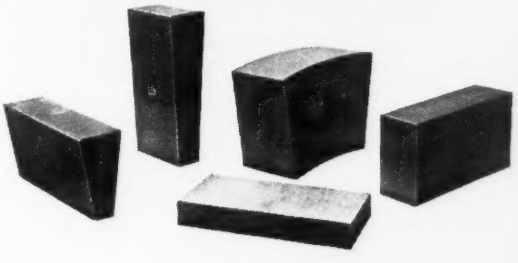

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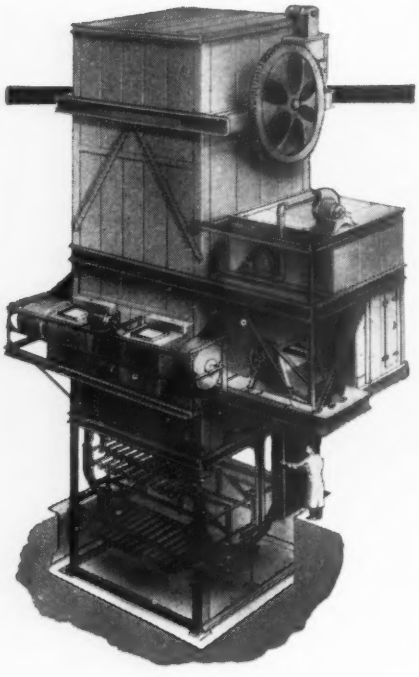

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Looking Back — After 43 Years

CATHARINE FLYNN, assistant secretary of the National Foundry Association, will retire on July 1 after 43 years of service with that organization. A number of women have won recognition as foundry owners or operators, but few are known nationally by so many foundrymen, know so much about the industry and traditions of the industry, and about the individual foundries as Miss Flynn does. She relates here some of her recollections of events in the foundry industry during her years with the association.

By CATHARINE FLYNN

LITTLE did I realize when I accepted a four-day assignment in 1913 to help out with some rush work at the offices of the National Foundry Association that this seemingly insignificant job would not terminate until 43 years later.

The executive staff then consisted of Jeffrey Taylor, secretary, and Arthur McClintock, commissioner—men then in the 35-year age bracket, both now deceased. Messrs. Taylor and McClintock had been with the association practically from its beginning in 1898 until their retirement in 1944, and the members of those decades know what an excellent team they were.

The prime mover in the organization of the NFA was John A. Penton of the Penton Publishing Co. (himself a molder), who also started FOUNDRY magazine.

When NFA was organized, one of the most pressing problems in the industry was the labor problem. The International Molders' Union, which was organized in 1858 and is the second oldest labor organization in America (the International Typographical Union is the oldest), had a monopoly on skilled foundry labor. If you wanted to make anything in the foundry you had to use skilled workmen, although foundrymen knew that not much skill was required to make certain types of castings. The union also endeavored to control the number of apprentices, and resisted the introduction of molding machines and other mechanical equipment.

So the foundrymen found themselves blocked in their efforts to improve production at a time when new industries were developing and the need for castings was expanding. In 1903 and 1904, however, the molders' union adopted a resolution permitting the operation of molding machines by union members.

In 1904, the NFA began the publication of a monthly magazine — The Review—20,000 copies of which were mailed to the homes of employees. Through this medium it stressed, among other things, the principles for which it stood:

1. The right of an employee to work, regardless of his affiliation or non-affiliation with a union organization.
2. The operation of molding machines and improved appliances without restriction.
3. The right of an American boy to learn the trade.
4. A fair day's pay for a fair day's work.

"Although the wording might be slightly different today," said NFA's President Summerfield Brunk in his report to the 1953 annual meeting, "the goals of the National Foundry Association have remained unchanged. Point for point—the right to work, the right of management to keep pace with engineering progress, the right to enter your chosen trade, and the right of the worker to fair and decent wages—all these remain unchanged through the years, proven over and over again."

Safety Promoted — In the rapid advancement in the science of management, no aspect has undergone greater change than plant safety. Forty years ago, before employers

and the public generally became "safety conscious," largely through the work of the National Safety Council, which was organized in 1913, and the formation of "in the plant" safety committees, the NFA saw the need for an educational campaign to promote safety in foundries. To carry out the project, in 1913 it appointed a Committee on Safety and Sanitation which made a study of the problems involved and the hazards in the industry. The outgrowth of the committee's investigations was a series of bulletins which were later revised, illustrated and compiled in the first such handbook for the industry—"Safety in the Foundry" (now out of print).

Designed Safety Devices

The committee also worked with manufacturers in the design of safety devices and protective clothing for foundry workers. For example, it was difficult to get a shoe company to undertake the manufacture and sale of safety shoes because workmen, as a rule, were hostile to the idea of personal safety as opposed to personal comfort. To meet this situation, in the early days the NFA underwrote the project by purchasing and carrying the stock of shoes at its headquarters.

These shoes were sold to employers at cost and they in turn sold them to their men. The demand for and the willingness of the men to wear the shoes, after the idea had been "sold" to them, soon induced the shoe manufacturers to take over the sale and distribution. And so the NFA dropped out of the business of buying and selling molders' safety shoes.

The Silicosis Problem — In the 1930's the silicosis problem became critical. Many suits were brought at common law against foundry operators by unscrupulous lawyers, doctors and employees. In many states, stringent laws were advocated, based on dust counts, and the NFA realized that these were not needed and that the foundries would have had difficulty in putting them into effect. Instead, reasonable occupational disease laws were passed.

Foundry managers realize that silicosis is a real and not a phantom disease; also that some foundries were negligent and that their shops did present a real hazard. But the prevalence and danger of silicosis was not nearly so great as the publicity would indicate. And here again the NFA undertook a thorough investigation with the idea of getting at the real source of the prob-

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lem and suggesting protective measures.

The problem was approached from the engineering standpoint—the control of dust at its source. But even this attack was not adequate because some men might already have been subjected to the disease before employment in another foundry, and so a further safeguard the NFA recommended to employers was the medical examination of employees before hiring plus periodic re-examinations.

Wisconsin had a major number of suits against its foundries and E. O. Jones of the Belle City Malleable Iron Co., Racine, was delegated by his company to assist in their defense. The association later engaged Mr. Jones for three years to head up its campaign of dust prevention.

Any discussion of dust control would be incomplete without a word about the Pangborn Corp., Hagerstown, Md., which pioneered in the manufacture of blast cleaning and dust control equipment. Its president, Thomas W. Pangborn, who was president of NFA from 1933 to 1936, has two strong interests—the education of our American youth and his business. It is well known he and his brother John have given much of their time and considerable of their resources to charitable and educational projects, through the Pangborn Foundation. Just recently the American Foundrymen's Society was the recipient of $50,000 to be used for scholarships.

Wartime Problems—During World War II, the changeover to production of military items brought difficult problems to many members of NFA. Casting difficulties were many, and new practices and methods had to be adopted. The association's foundry engineer, Gottfrid Olson, assisted members in solving these production problems. There were also many calls for help in clearing up production and labor records, costs, priorities, training, and other problems that war brought to the foundrymen.

In 1941, when a shortage of help was already being felt, the Association prepared a training course entitled "Short Term Training in the Foundry." More than 7000 copies were distributed to foundries, technical schools and Navy Yards, and orders came in from practically all the free nations of the world.

Foreman Relations—Beginning in 1944 the NFA devoted considerable effort to improve management's relations with its foremen. The subject was approached from both the administrative and operating stand-

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points. The committee's work covered four fields:

1. Management and foreman relations.
2. Employee-foreman-employer relations.
3. Materials and practices of foreman training.
4. A plan of procedure for practical development of foremen.

Herman Menck, vice president in charge of manufacturing, Harnischfeger Corp., Milwaukee, was the committee's chairman. Mr. Menck was NFA's president from 1944 to 1946, but his active participation in the operation of the NFA did not terminate with his tenure of office. No man perhaps has had more at heart the success of NFA than Herman Menck.

Started Regional Meetings

To increase the value of the association to its members on a local level, a series of regional meetings was started in 1949. These meetings now are scheduled regularly in some of the larger foundry centers. Originally these meetings were devoted largely to discussions of legislation, but in later years the meetings have been devoted to industrial relations and labor problems. I. Richards Wagner (retired, but at that time president of the Electric Steel Castings Co., Indianapolis) was the enthusiastic promoter of this activity. Mr. Wagner was NFA's president from 1946 to 1948, but in subsequent years he also attended these meetings and participated actively in the program.

Historically, the association has been the watchdog of the industry's interests in the legislative field, and at least once a year NFA meets in Washington with Congressmen where the members have an opportunity to tell our legislators about their problems and how some of the legislation proposed would affect the economy.

Any reference to NFA's annual meetings would not be complete without mentioning C. K. Robinson, president of Swayne, Robinson & Co., Richmond, Ind., who has attended a greater number of annual meetings than any other member. He made the comment a few years back that he wondered whether he or I held the record. I am sure I do, for while his company has been a member of NFA since 1901—55 years—Mr. C. K. Robinson falls way short of attending this number of meetings. Another "Robinson" (H. R.) was president of Swayne, Robinson in those earlier days.

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16
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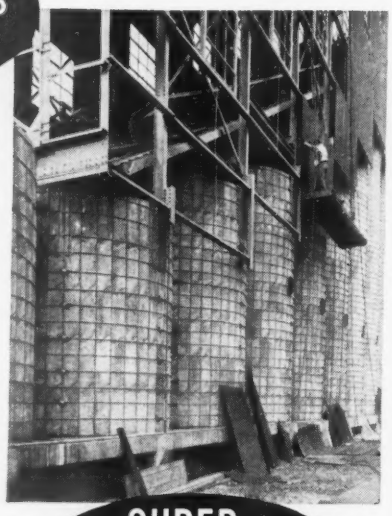

These bins are used for handling silica sand. They range in size from 18′ dia. x 52½′ high to 12′ x 12½′. Machinery for screening and grading the sand is mounted directly on the bins without extra supports, proving the load-bearing strength of Neff & Fry construction.

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gether wholeheartedly on their plant problems but the associations that cover the industry do a good job of collaboration on those activities that are common to all segments of the industry. A call for even greater solidarity within the association field was sounded by Frank Steinebach, editor of FOUNDRY, in 1946. It was his thought that an over-all group would add force and effect to the existing foundry organizations when national issues affecting the entire industry were involved. This resulted in the organization of the National Casting Council, which at present is made up of two representatives from each of the 11 associations working in the foundry and allied fields.

Industrial Relations—No phase of management has received more attention during the last two decades than that concerned with labor and industrial relations. Passage of the Wagner Act in 1935 gave organized labor domination in this area, although the law's effects were balanced somewhat by the passage in 1947 of Taft-Hartley.

No longer are questions of wages, hours and working conditions a matter of negotiations between the individual worker and his supervisor but rather are subject of negotiations between top management and union agents representing not only employees of a single shop but often workers in an entire industry.

The role of the National Foundry Association in this new aspect of labor-management relations cannot be over-emphasized. And on my retirement from NFA, I find myself leaving a staff of men who are excellently equipped to meet the needs of NFA members and the foundry industry for advice and counsel on industrial relations and labor problems.

Just to illustrate one phase of the present NFA labor relations program —contract analysis. Members send in their labor agreements for periodic review. The NFA, receiving hundreds of such agreements from all areas of the country, makes recommendations for improvements where possible and suggests the bargaining techniques necessary to achieve these improvements. A follow-up file indicates when a member company is likely to enter negotiations, and at this time all available information is sent on recent settlements, local and national, union demands and any other information which might better equip a company at the bargaining table. Sources of information available to unions are great and their methods

of assembling and disseminating the data may improve because of the recent merger of the AFL and CIO. The NFA forearms foundry management with data so that it can go to the bargaining table as well prepared as its union counterpart.

Al Martens, president of Pekin Foundry & Mfg. Co., Pekin, Ill., and NFA's president from 1950 to 1952 said in his report to the 1950 annual meeting:

"Years ago when we started in the foundry all we needed was intestinal fortitude and initiative. Today we need both of these plus a knowledge of many orders, regulations and laws. These tell us what we can and cannot do in the matter of wages, hours and working conditions, contracts, etc. That is the field where the NFA can help the small operator."

Big companies may be able to maintain special departments with trained legal personnel to interpret the latest directives and orders, but many of the small and medium-sized foundries cannot afford this. The NFA staff is geared to do this job and to cope with the increased power of labor unions today. This labor relations activity has over the years held the No. 1 spot in NFA's service to the foundry industry.

Dietert Co. Will Offer a Sand School in Detroit Aug. 20-22

A sand school for foundry supervisory and technical personnel will be held in Detroit, Aug. 20-22, at the Detroit Engineering Society, under the sponsorship of Harry W. Dietert Co., Detroit. No charge will be made for attendance.

Sessions will be patterned on the theme that foundry sands greatly affect foundry costs, particularly in these two ways: 1. The ease with which a coremaker or a molder can work can be altered materially by compounding an easily worked sand. 2. Casting quality can be improved and scrap loss reduced by proper selection and control of sand.

Structural, green, air-set, dry, hot and retained properties of sand will be studied in detail. Proper selection of the better numerical values of each essential sand property will be given, and emphasis will be placed on the fact that sand requires the least attention and is the most foolproof when essential properties are controlled at selected values.

The lectures will be given by Victor M. Rowell, Harry W. Dietert Co. They will be illustrated by motion pictures and slides.

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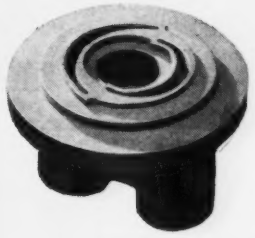

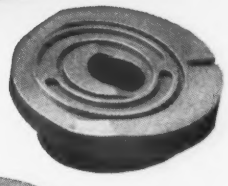

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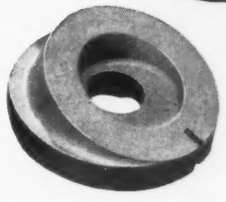

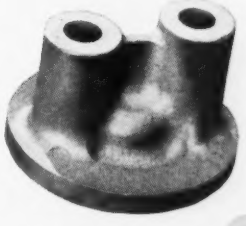

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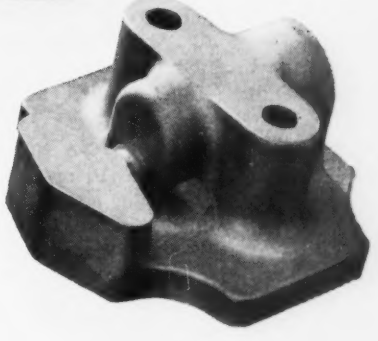

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Results are like those shown here. The accuracy of these castings for the Sundstrand Truck Refrigeration Drive is such that a number of machining operations are eliminated. Produced by the Brillion Iron Works, Brillion, Wis., they enable Sundstrand to obtain a valving surface that could not be generated on a milling machine.

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Foundry Group Meetings

Pine State: Raymon Meader, foundry superintendent, Whitin Machine Works, Whitinsville, Mass., moderated a panel discussion of scrap problems on Apr. 5 as the Pine State Foundrymen's Association held its spring meeting at the Falmouth Hotel, Portland, Me. Many scrap problems were presented and discussed. Scrap castings were on display.

Panel members were Percy Skewes, foundry superintendent, Concord Foundries, Concord, Mass.; Alex Beck, general manager, Whitman Foundry Inc., Whitman, Mass.; John Dahlberg, foundry superintendent (retired), Kidder Press, Dover, N. H.; Clyde Lake, foundry superintendent, Hyde Windlass Co., Bath, Me.; John Morton, foundry superintendent, Saco-Lowell Shops, Biddeford, Me., and Joe Legendre, owner and operator, Lewiston Brass Co., Lewiston, Me. — *James Hamblin, Saco-Lowell Shops.*

Lehigh Valley: The Lehigh Valley Foundrymen's Association met at Lafayette College, Easton, Pa., on Apr. 10 to hear Robert B. Fischer, metallurgist, Ingersoll - Rand Co., Phillipsburg, N. J., speak on some factors influencing gating and risering of various metals. Over 100 persons attended. Hans Jacob, foundry superintendent, Lehigh Inc., presided and H. D. Horton, foundry superintendent, Ingersoll-Rand Co., served as technical chairman. Prior to the talk, the AFS color film on the fluid flow of light alloys through vertical gating systems was shown.

To produce sound castings consistently, many factors and variables must be controlled. The foundryman must know how metals flow through various gating systems. A knowledge of the characteristics of metals and how mold material reacts to metal poured into it also is essential. Types of castings being made will influence the practice used. Extreme care in gating, risering and chilling techniques is required for pressure and x-ray quality castings as they require internal soundness as well as a satisfactory external appearance.

Mr. Fischer used slides to show how the shrinkage characteristics of metals, pouring temperature, mold materials, contamination, deoxidation, degassing practice and drossing tendencies will influence gating and risering practice. Importance of chills in intricately designed pressure castings was discussed.—*Ronald C. Moorhead, Ingersoll-Rand Co.*

Eastern New York: The annual meeting of the AFS with the ASM chapter was held Apr. 17. Speaker was A. E. Blake, manager of engineering, foundry department, General Electric Co. He participated in European foundry surveys in 1950, 1954 and 1955 and his talk covered nondestructive testing, sand mixes, vacuum degassing, high temperature castings and steelmaking processes as they are practiced in Europe. Slides were shown to illustrate the construction that had taken place between the speaker's first and most recent visit. Much emphasis in Europe is being placed on basic and applied research and in the opinion of Mr. Blake, European technology is high, production low and working conditions inferior to those in this country.—*Martin L. Slawsky, Watervliet Arsenal.*

Wisconsin: Oldtimers and Apprentices meeting of the AFS chapter was held May 25 at Hotel Schroeder, Milwaukee. Plaques were awarded to 21 new members of the Old Timers Club (engaged in foundry service for 50 years or more). Membership in the club now numbers more than 100.

Thirteen apprentices were given awards for their winning entries in the chapter's annual apprentice contest. Wood Patterns—First, Gene D. Zabler, Racine Hydraulic & Machine Co.; second, Robert Pavia and third, Robert J. Madecky, both from Case Co., Racine, Wis. Metal Patterns—First, Roy Schutte, Allis-Chalmers Mfg. Co.; second, Harold Stannard and third, Edward Perry, both from Nelson Pattern Co.

Ferrous Molding—First, Thomas C. Janke, Nordberg Mfg. Co.; second, Raymond Martens, Brillion Iron Works, Brillion, Wis.; third, Ray Hollfelder, Zenith Foundry Co. Steel Molding—First, Raymond G. Guttman, Bucyrus-Erie Co., South Milwaukee, Wis. Nonferrous Molding—First, Donald Tetzlaff, Allis-Chalmers Mfg. Co.; second, Raymond Montano,

NEW ENGLAND: The chapter recently affiliated with the AFS and became the 45th group in the national organization. At left, A. B. Steck, looks on as William Maloney, general manager, AFS, presents the traditional cast iron rattle to A. M. Nutter, E. L. LeBaron Foundry Co., chapter president. In the center photo, front row, left to right, are Frank Shipley, Caterpillar Tractor Co., national president, AFS; J. L. Ullrich, regional director, AFS; Philip Smith, General Electric Co.; Frank Benoit, Brown & Sharpe Mfg. Co.; Mr. Maloney and Charles Hutchins, Standard Foundry Co. In the back row, left to right, are William Ohlson, Draper Corp.; Alexander Beck, Whitman Foundry Co.; Mr. Nutter; Fred Holway, Mystic Iron Works and Warren Murdock, Helantha Corp. The chapter members form the newly elected executive committee. Clyde Armstrong, Warren Foundry & Pipe Corp., chapter vice president, was absent. At right, A. B. Steck, General Electric Co., is shown addressing the chapter at the technical meeting. Photos by courtesy of J. H. Orrock, Debevoise-Anderson Co.

Ampco Metal Inc.; third, Edward W. Skibbie, Nordberg Mfg. Co.

In the national contest, Messrs. Tetzlaff and Montano placed first and second, respectively, in the non-ferrous molding division. The chapter's annual picnic and outing will be held July 27 at Tuckaway Country Club, near Milwaukee.—*John E. Hubel.*

Connecticut Non-Ferrous: A discussion of the "Titanium Industry Today" was the topic of Gene Erbin, metallurgical engineer, Titanium Metal Corp. of America, New York, as he addressed the Connecticut Non-Ferrous Foundrymen's Association at the Quinnipiack Club, New Haven, Conn., on Apr. 18. Mr. Erbin prefaced his remarks with a brief history of titanium and slides were shown covering applications. Diagrams illustrating the process for producing sponge titanium from titanium ores were also presented.

Casting of titanium is difficult because of a strong tendency of the metal to dissolve oxygen, nitrogen and carbon when in the molten form. Heavy contamination by these elements seriously damages the properties of the resulting metal. Lack of suitable crucible and mold material that will not contaminate molten titanium has prevented a large use of titanium castings, according to the speaker. Present-day casting techniques all involve use of vacuum atmospheres to reduce air contamination.

Future of the titanium industry depends upon development of new alloys that are superior to competitive materials, reduction of the price of titanium products and diversification of markets for titanium. Mr. Erbin answered questions pertaining to the metal and its casting possibilities with strong emphasis on the difficulties encountered during melting and casting operations.

Northeastern Ohio: About 250 members and guests of the AFS chapter met May 17 at Tudor Arms Hotel, Cleveland, to honor its past presidents and oldtimers. David Clark Jr., Forest City Foundries, immediate past chapter chairman, presented outgoing chairman Lewis T. Crosby, Sterling Wheelbarrow Co., with a plaque in recognition of his service.

Nearly 100 old timers attended and were seated in groups according to the number of years of service in the industry. Certificates were awarded to those men having served for 40

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years or more. Those with 50 years or more of service were awarded certificates and a 50 year pin from the AFS. Past presidents of the chapter introduced the oldtimers seated in the various groups and announced the collective total years of service within each group. An old-fashioned songfest was held between the groups with prizes being awarded the winning combinations.

Election of officers was held and the officers for 1956-57 are Alexander D. Barczak, Superior Foundry Inc., chairman; E. Claude Jeter, Ford Motor Co., vice chairman; Emil Romans, National Malleable & Steel Castings Co., 2nd vice chairman; Howard E. Heyl, Federal Foundry Supply Co., secretary and Harold Strater, North American Refractories Co., treasurer.

Board of directors, three year term: Warner B. Bishop, Archer-Daniels-Midland Co.; E. Robert Brennan, Forcest City Foundries Inc.; John H. Sibbison Jr., Kerchner Marshall Co.; Harold Wheeler, Allyne-Ryan Foundry Co.; John F. Wallace, Case Institute of Technology. Board of directors, one year term: John S. Parker, SPO Inc. Mr. Crosby will join the board for one year as immediate past chairman.—*Kenneth L. Mountain.*

Philadelphia: A talk on the CO_2 process by Hans J Heine, technical director, AFS, attracted 174 members and guests to the Mar. 9 meeting of the AFS chapter at the Engineers' Club, Philadelphia. Attendance was thought to be the largest ever to attend a chapter meeting of this group.

Over 100 members and guests attended the Apr. 13 meeting, also held at the Engineers' Club. Three roundtable discussions covering gray iron, brass and bronze, and steel subjects made up the technical program.

Chairman of the gray iron group was E. H. Enderlein and the speaker was John Anspach. Chairman of the brass and bronze group was William Grimm; speaker was C. A. Robeck. Chairman of the steel group was John Czaklos; speakers were Ed Roberts and Phil Grimard.

Chapter's annual picnic and outing will be held at the Manufacturer's Country Club, Oreland, Philadelphia, Pa., on July 20.—*Charles R. Sweeny, Atlantic Steel Castings Co.*

Ontario: A ladies night program of the AFS chapter was held Apr. 27 with about 250 persons attending and enjoying cocktails, dinner, entertainment and dancing. Hold-

ers of lucky numbers were awarded prizes.

Meeting season was closed on May 25 at the Royal York Hotel, Toronto, with a presentation of awards to contest winners and business reports from the directors and committee chairmen. Total membership reached 396, with 59 new members having been added to the roster during the year.

Top award in the chapter's paper writing contest went to John Allan, Rockwell Mfg. Co. of Canada Ltd., for a paper on "Shrinkage Problems in Cast Iron." Other awards went to R. Hepburn, Soil Pipe & Fitting Ltd., for "Points of Interest When Converting to CO_2 Process in the Iron Foundry," E. J. Skelly, Standard Sanitary & Dominion Radiator, for "Cleaning Room Practice and Economics" and O. Scott, McCoy Foundry, for "Coremaking Practice."

Arthur Berge, St. Catherines Brass Works Ltd., third place winner in the nonferrous molding division, AFS national apprentice contest, was presented with a check and certificate.

A film, "The Man With Five Fingers," illustrating the Kitamat aluminum facility in British Columbia was shown to conclude the year's activities. — *David Magder, United Smelting & Refining Co., and Len Humphreys, A. H. Tallman Bronze Co.*

Central Ohio: "Cupola Operation" was the subject of Dave Sanner, plant metallurgist, Cooper-Bessemer Co., Mt. Vernon, O., at the Apr. 9 meeting of the AFS chapter at the Seneca Hotel, Columbus, O. Speaker indicated that the objective of sound cupola operation is to produce metal containing the desired qualities. To produce consistent results the velocity of the blast, charge make-up and slag conditions must be controlled properly. Complete cooperation between metallurgist, cupola operators and all foundry personnel must be present for efficient cupola operation.—*Jose Acebo, Ohio Malleable Division, Dayton Malleable Iron Co.*

Chicago: The final meeting of the 1955-56 season for the AFS chapter was held May 14 at the Chicago Bar Association. Main feature was a movie—"Convention Highlights"—partly in color, taken and made available by Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago. Narration was handled by I. H. Dennen, advertising manager of the company.

The film covered the AFS Nation-

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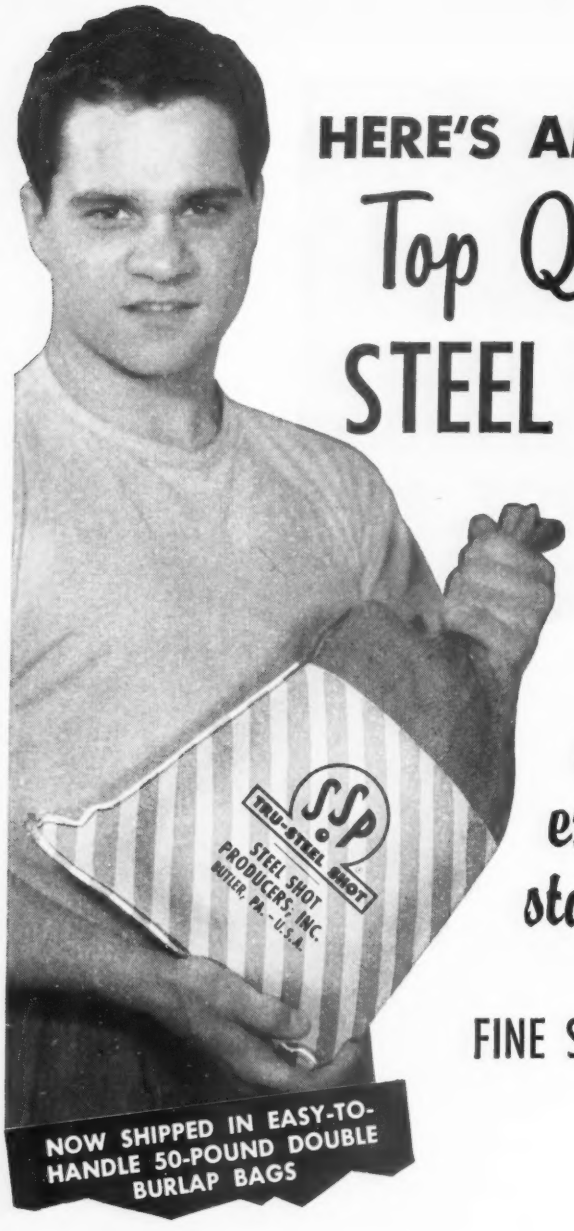

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al Convention and Show held in Atlantic City, May 3-9, and was of interest to those who had been in attendance and to those who were getting a second-handed look at the event. Skillfully included were Atlantic City and Board Walk shots as well as views of the show and equipment displayed.

President James T. Moore, vice president, Wells Mfg. Co., summarized the year's activities. Among the highlights noted was that membership has increased from 697 to 824. During the year the Robert E Kennedy Scholarship Endowment was enlarged from $5000 to $6425.

President Moore announced that election of candidates presented at the April meeting (FOUNDRY, May, p. 285) was declared unanimous. Mr. Moore introduced President-Elect Robert P. Schauss, Chicago manager, Werner G. Smith Inc., who presented Mr. Moore with the chapter's "Oscar," the past president's statuette, in recognition of his service during the past year. At a subsequent meeting of the new officers and directors, L. J. Jacobs, research manager, S. Obermayer Co., was reappointed chapter treasurer.

The chapter will hold its Annual Stag and Golf Outing at Lincolnshire Country Club, Crete, Ill., on Saturday, Aug. 11. Attendance will be restricted to 500.—*Erle F. Ross.*

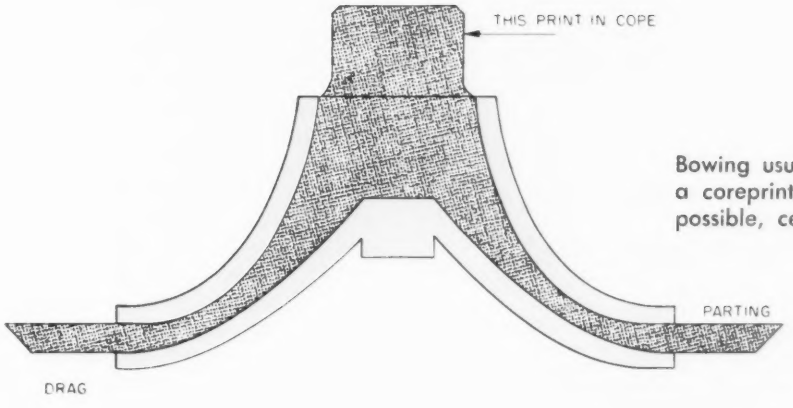
San Antonio Section: John Laux, M. A. Bell Co., discussed the cupola and its operation before the AFS chapter at its Apr. 23 meeting at the Alamo Iron Works. Thirty-five members and guests were present. Refreshments were served by the M. A. Bell Co.

Fifty-two members and guests of the group met on May 28 at the Alamo Iron Works and heard Ed Alther, Cities Service Oil Co., talk on core oils, their history, potentials and applications. Refreshments were served by the Kincaid-Osburn Electric Steel Co.—*Frank A. Fournier Jr., F. & J. Pattern Works.*

New England: The AFS chapter met May 23 at the Sloane Processing Laboratory, Massachusetts Institute of Technology, Cambridge, Mass., to hear Charles C. Reynolds, S. M., assistant professor of metallurgy, MIT, talk on "Shrinkage Characteristics of Ductile Iron." There were 130 members and guests present. Mr. Reynolds explained what has been done to defeat or alleviate the shrinkage characteristics and peculiarities of ductile iron.—*Fred S. Holway, Mystic Iron Works.*

Trouble Shooting

By C. W. AMMEN



Bowing usually is caused by too small or too short a coreprint in the OD of the impeller. Wherever possible, center print should come up in the cope

Sand Mix for Impeller Cores

Dear Charlie:

Looks like our luck is running true to form. You remember the fully shrouded pump impellers we make and have made for some time? Well, the boss coremaker who has been with us went to the happy hunting ground, and now it seems that all these years he was not using the core mix we had formulated for the impeller cores. No one knows what he made up, but it was A-1, and now we are in deep trouble no end.

Tried Original Mix—The original mix has been tried, as have countless others, and the scrap is still 'way out ahead. Our trouble is fissures or fins and wool at the junctions where the blades meet the shrouds. In extreme cases, the fin goes clear across between blades and stops off the waterway. Various corewashes are somewhat helpful, but not enough. Is this an expansion problem? Also, some cores seem to bow toward the cope. How's about a good impeller mix?

Sincerely,
Sam

Dear Sam:

Sure got a bang out of your letter. It reminded me of a question I once ran across in "Questions and Answers" in FOUNDRY. This gink wrote in asking for a bot (bod) mix. It seems that the stack tender had quit, taking the formula with him and leaving these gents up to the knees in iron with no cork. How about that?

Formulate Mixes in Shop—Sam, often there is little or no relation between formulas and procedures set up in the office and those in actual use by the shop. Time and time again I have seen some bright lad with a high forehead and a slide rule make some very rapid and inaccurate calculations and come up with a core mix he was sure was a mix to end all mixes. This formula is sent out to the guy on the mill, who already has decided that the lad not only is a bum, but that if his brains were put in a gnat it would walk backwards. So he rolls the formula into a little ball, and that's the end of it.

If the guy on the mill is on the ball, the cores are good, the lad in the office is happy with his earth-shaking mix, and no one is the wiser. Then the guy on the mill hits the sidedoor Pullman for his winter trip to Florida, and a new mill hand is put on and given the formula, which for some unknown reason now won't work. It's the fault of the new man. The office is sure of that since this formula has been used successfully for some time. The new man then fiddles around, comes up with a workable mix, and all is well again? Or is it? Now you ask me for a good mix for impeller cores. Should I take my slide rule and be the lad with the high forehead?

Suppliers' Mixes Are Guides—Formulas for core mixes given in texts and pamphlets put out by binder suppliers are for the most part only for typical mixes to use as a general guide. You are supposed to take it from there. The mix depends on your condition and the materials available. I have seen a coreroom with 15 different mixes reduce to two—one bench and one blow—because all 15 were basically the same as far as the characteristics of the finished cores were concerned.

Now don't get me wrong. I am not trying to make the boys in the front look like dunces, but to get them to work toward a close coordination between the shop and the office. The lad with the slide rule should give ground as well as the guy on the mill, and they should come up with a recorded process and procedure which represents the actual practice, not two different things.

We found one time that a core defect stopped when the mill man began to add a snuffbox full of iron oxide to the batch. We weighed up a snuffbox of Fe_2O_3, reduced it to a percentage, added it to the master data sheet and laid in a supply of snuffboxes. Should we lose our snuffing sand man and have to replace him with an abstainer, all would be well now.

Variables Prevent Rigid Rules—Rigid rules for core mixes could be set down only provided that nothing was variable. Since this is not the case, we can be guided only by general data and, finally, by results;

consistent results can be had only by measuring the ingredients by weight, standardizing mixing procedure against results and nailing this and the mill operator to the wall, along with baking time, temperature, etc.

Now to your defect. This type often is attributed to expansion and contraction of the core, causing it to crack. Actually, this defect is caused about 90 per cent of the time by too-early collapse of the core. The same defect is common in heavy brass bushings. In extreme cases the entire ID is a mass of wool.

Sometimes a wash containing iron oxide will lessen these defects, only to lead the unwary off on a hunt for a better coating. Controlling collapsibility of a core so that it will not collapse until the casting has taken a set, but will collapse soon enough to prevent hot tearing, is simply a trial-and-error problem until a suitable mix has been arrived at.

Elimination of Fins—It has been found that an addition of from 1 to 2 per cent of iron oxide to oil-bonded cores will greatly reduce or eliminate fins, fissures and wool. The theory is that the iron oxide insulates the core binder, thus retarding its too-early collapse. The addition of silica or zircon flour has a similar effect. Another theory is that the atmosphere in and about the core is reducing, bringing about a chemical reaction between the iron oxide and the silica. This reaction forms a silicate which acts as a binder and helps the oil binder to hold the core together.

The general rule is to use only sufficient oil in the mix to coat each grain with a thin film of oil. An excess not only adds to the cost, but also produces some fine scrap. This kind of coating can be accomplished only by using the right percentage of oil with respect to the total surface area it must cover (this figure varies with the type of sand chosen and its grain size). The mixer must be a good clean one that does a real job of mixing. A touch of insurance oil (kerosene) will aid in the distribution of the oil. Select the coarsest sand possible with respect to finish desired.

Making a Core Mix—We'll use the figures 7.5 lb per gallon of core oil, or 1.875 lb (1.9) per quart, and 12 lb per gallon, or 3 lb per quart, for the sand. We can reduce our ratio by volume to percentage of weight of oil against weight of sand to give any desired ratio. Working from 1 to 40 to 1 to 100 parts of oil to sand, using 1 to 2 per cent iron oxide by weight, make trial cores at each ratio and compare results until a suitable mix is found. Because sands and binders vary in weight, you should establish the correct weights against volume measure.

If bentonite or some other form of clay is used to add green strength, additional oil is required to offset the absorption of the binder by the clay or bentonite. When you have a mix which gives you the highest percentage of good, clean castings, you will have eliminated the fissures or fins or have reduced them to a minimum. A good commercial core wash to which 2½ or 3 per cent of vinegar has been added then will reduce streaking and tearing.

Streaking on Cores—If the cores have a tendency to streak or to leave uncoated spots and bare grains on vertical surfaces, the cause generally is waterproof spots from excessive dry or liquid parting or soot or oil deposits from faulty core oven operation. This problem sometimes can be eliminated by the addition of 3 to 4 per cent isopropyl alcohol to your wash.

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Once a suitable wash and a good core mix, recorded both by per cent of weight and volume, have been worked up, make sure that they represent the actual practice in the shop and stick to them. Deviations from good practice by the operators, unknown to management, are in most cases with good intentions, but should be considered silent insubordination. Suggestions from employees as to new practices are welcome and should be encouraged, but management should have the right to decide about their use.

Measure Ingredients Carefully — Be careful with the oil-to-sand ratio; measure each batch carefully. The usual per cent by weight of oil to sand used ranges from ½ to 1½ per cent. This narrow weight range takes you from about 1 to 120 by volume to 1 to 40 by volume, illustrating that a small change in the per cent of oil by weight makes a considerable change volumewise. This circumstance accounts for occasional drastic variations from batch to batch. Operators for the most part cannot see that a little more or less binder per batch can affect the results, and they will swear that each batch is the same. The difference between, say, 1 qt of oil or ¾ qt of oil added to 60 qts of sand is of no consequence to him. Employees should be instructed properly and shown that a small variation at one stage of the game may cause a large variation in end results.

Avoiding Bowed Cores—A mix is formulated to produce a desired set of characteristics and results, and a good knowledge of exactly what each ingredient will do and produce is necessary in order to come up with consistently good results. The bowing of which you speak is not a common impeller problem, but usually due to too small or too short a core print at the OD of the impeller. Wherever possible, the center print should come up in the cope, not in the drag. Should it come in the drag, it should be nailed.

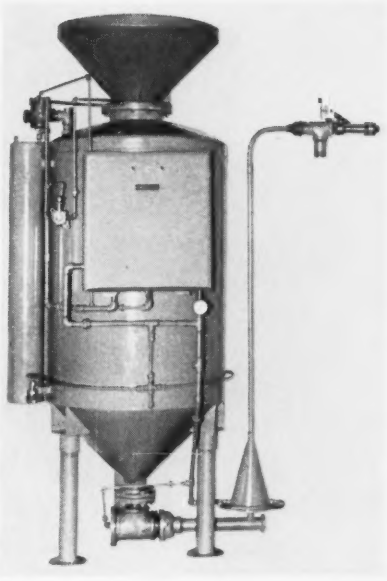
On extremely thin cores of considerable diameter, where the lifting force of the metal coming in the drag, under the lower side of the core, causes it to bow or in some cases to crack or break, you should have sufficient coreprint on the OD to give the core as much rigidity and support as possible. Avoid binders or oil-to-sand ratios which tend to make cores collapse very rapidly.

Sincerely,
Charlie

Revolutionizes Sand Systems

the HARTLEY BOND FEEDER

- MEASURES
- TRANSPORTS
- SPEEDS-UP



Haylco, the originator of automatic moisture controls for sand systems, invites inquiries on its newest development illustrated here. Hopper sizes start at 28 cu. ft. Bond is transported to mixer in precisely measured quantities which can be changed instantly. May be located at floor level, or below, any distance from mixer. Ideal for multiple mixing units operating from same hopper.

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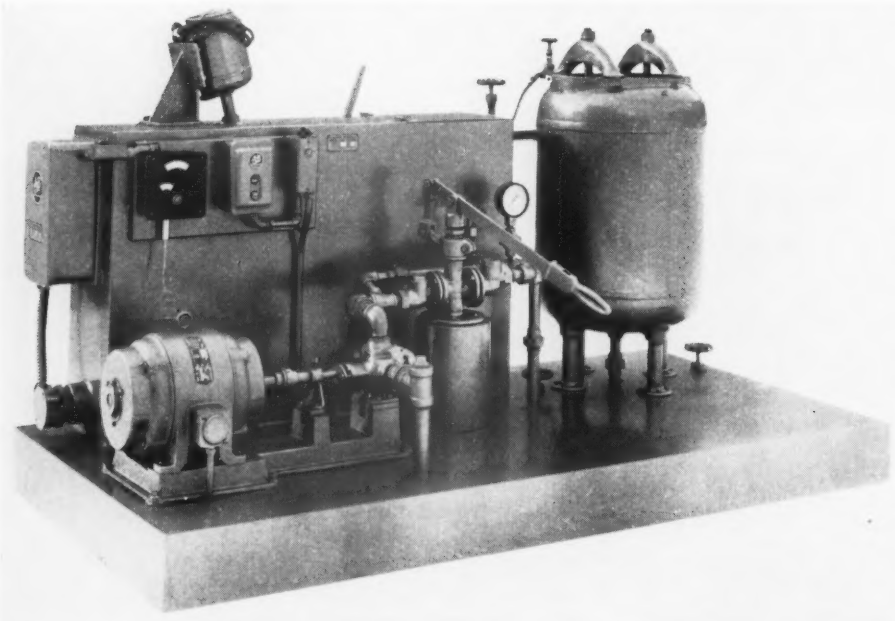

The value of castings saved by the company that installed the pictured TINCHER HIGH PRESSURE IMPREGNATION EQUIPMENT equalled the equipment's cost after the first day's operation!

Floor space	21 square feet
Heating Medium	Gas, steam or electric
Cost	$2450 to $2800
Delivery	One to two weeks
Terms	1% 10; net 30
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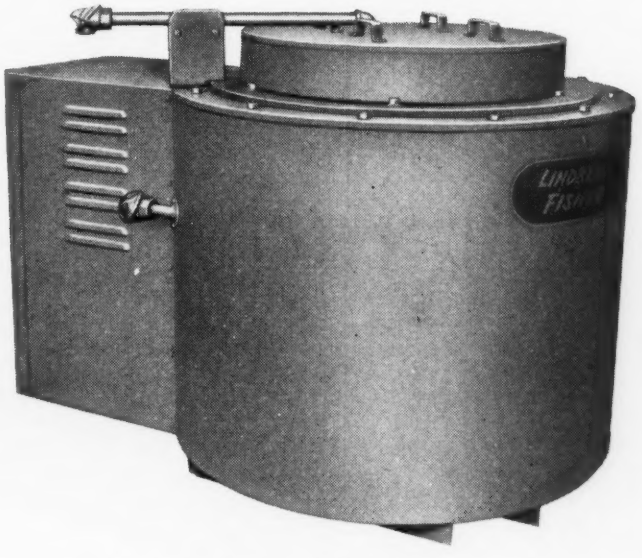
New From Lindberg-Fisher

For Permanent Mold and Sand Casting of Aluminum, Magnesium, Zinc and Lead.

A Lindberg-Fisher Electric Resistance Melting Furnace can mean lower cost per lb. of finished casting.



These furnaces eliminate localized heating of metal, eliminate gas absorption, because there are no products of combustion present. Higher production results, due to less operator fatigue. Exhaust fumes and smoke are nonexistent and radiation loss is held to an absolute minimum by use of high quality insulation.

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...with Ni-Rod electrodes

This weldor is completing fabrication of a grinder pedestal — profitable product of a Canadian foundry.

The design calls for joining the 1-inch steel-pipe uprights to the cast iron members. With easy-handling Ni-Rod* electrode, it's a *quick* job!

For the manufacturer, it's a *money-saving* job — far less costly than assembling the pedestal by machining and bolting.

Many shops and factories save time, reduce production costs, with Ni-Rod — the electrode with the nickel core wire and special flux. Even weldors of limited experience get good results. Strong, smooth welds. Machinability that is important in production work.

Another big advantage: preheat or postheat is seldom needed with Ni-Rod electrodes. And weld metal matches the color of the cast irons closely.

Produce or repair cast iron equipment with Ni-Rod and Ni-Rod "55"* welding electrodes — and save money in your plant, too. Send for Inco's folder called "Repair Cast Iron Parts, Quickly and Easily." It contains illustrated stories of successful welding: production work, emergency repairs, and more. Just write:

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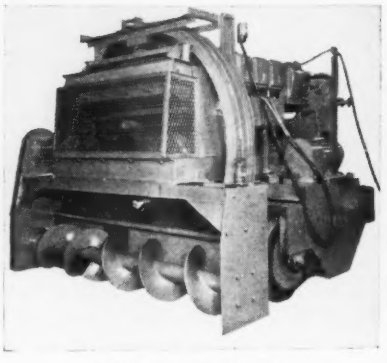

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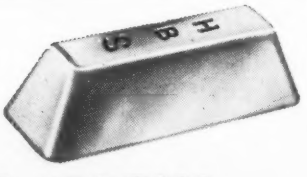

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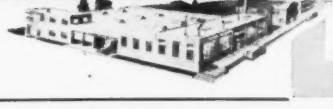

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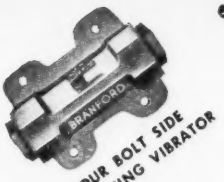

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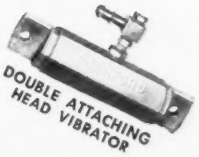
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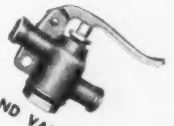
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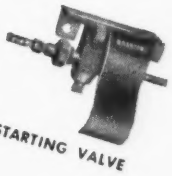
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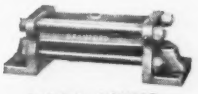
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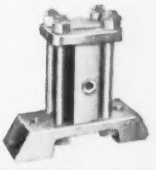
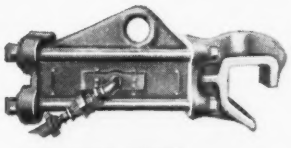

END MOUNTING VIBRATOR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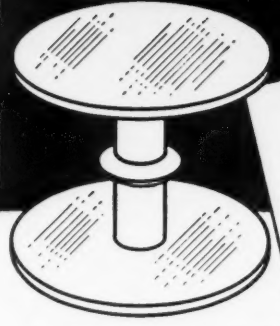

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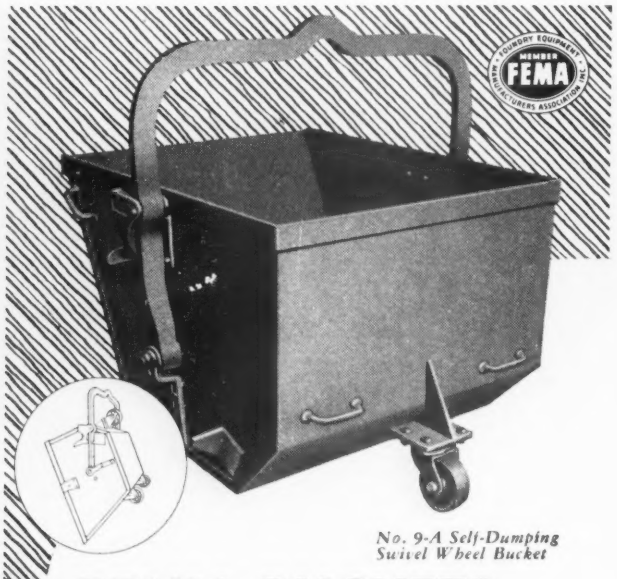

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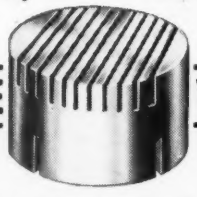

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CONVENIENT PLANTS:

Deliveries from nine plants located in Anderson, Indiana; Baltimore, Maryland; Buffalo, New York; Chester, Pennsylvania; Jeffersonville, Indiana; Kansas City, Kansas; Rahway, New Jersey; St. Louis, Missouri; Utica, Illinois.

LONG EXPERIENCE

PQ silicates have been made since 1860. Helpful data on silicates and their uses available in PQ bulletins. Request a copy of PQ Silicates in the Metal Industry.

PHILADELPHIA QUARTZ COMPANY
1831—125TH ANNIVERSARY—1956
1062 Public Ledger Bldg., Phila. 6, Pa.

PQ SOLUBLE SILICATES
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Trademarks Reg. U.S. Pat. Off.

Circle 735 on Inquiry Card

SCHNEIBLE

Ventilation in your foundry a tough nut to crack?

Not if you specify Schneible

You can place your problem in the hands of Schneible engineers with perfect confidence. More than twenty years of experience in foundry ventilation applications go into the recommendation of each piece of equipment for your operation.

There is a Schneible Hood for every need, and the patented features of this equipment have saved foundrymen many, many thousands of dollars through the years.

Schneible Uni-Flo Fractionating Hoods allow you to cut in half the amount of air vented to the dust collector, making your initial equipment investment much smaller.

Schneible Uni-Flo Compensating Hoods maintain a nicely adjusted balance of air in your plant, making better working conditions in all seasons.

All of the Schneible Hoods; shakeout, pouring, mold conveyor, casting cooling, etc., are designed for top efficiency and economy.

Write today for our BVB Bulletin and #450 Foundry Hood Bulletin. You will be pleased with the flexibility of Schneible Hoods.

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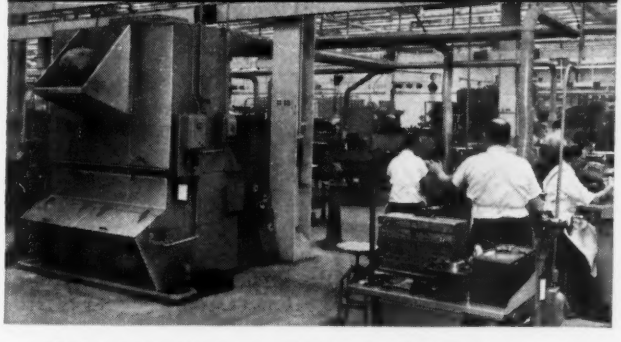
SERVING FOUNDRYMEN THE WORLD OVER

Circle 737 on Inquiry Card

NEWCOMB-DETROIT EST. 1912

- INDUSTRIAL OVENS
- DUST COLLECTORS
- SPRAY BOOTHS
- PARTS WASHERS



UNI-WASH DUST COLLECTORS

Compact, complete recirculating Water-Type Dust Collectors for industrial processing dusts. Dirt is collected as wet sludge which may be carried away automatically. No moving parts. Extremely efficient for grinding operations. Eliminates danger of explosion from magnesium and aluminum dust. Proven in foundries. Standard Units available.

For Bulletins and Quotations, write to:

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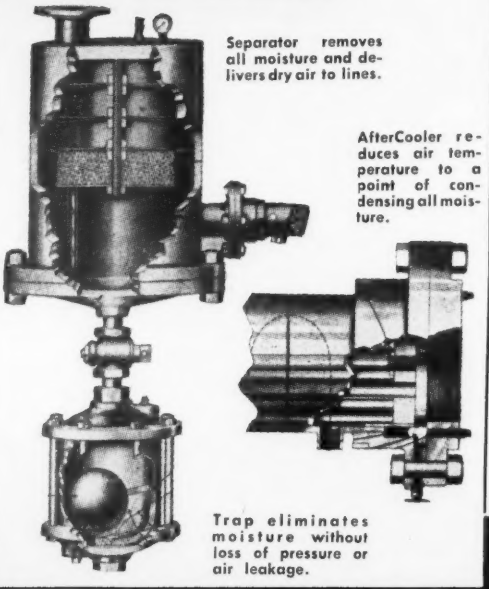
NOW! POSITIVE MOISTURE REMOVAL
FROM COMPRESSED AIR LINES WITH THE
MURPHY AFTERCOOLER SYSTEM

The Murphy AfterCooler System guarantees the elimination of water in all compressed air line installations. Installation is simple and unit requires a minimum of maintenance. For cool, clean, dry air . . . for eliminating "down time" in compressed air operated tools and equipment . . . install a Murphy AfterCooler System in your plant now!

Write today for Bulletin No. 1, outlining complete details on the Murphy AfterCooler System!

GUARANTEED COMPRESSED AIR PRODUCTS
AFTERCOOLERS • SEPARATORS • STRAINERS
TRAPS • SPRAY GUNS • PISTOL SPRAYERS



Separator removes all moisture and delivers dry air to lines.

AfterCooler reduces air temperature to a point of condensing all moisture.

Trap eliminates moisture without loss of pressure or air leakage.

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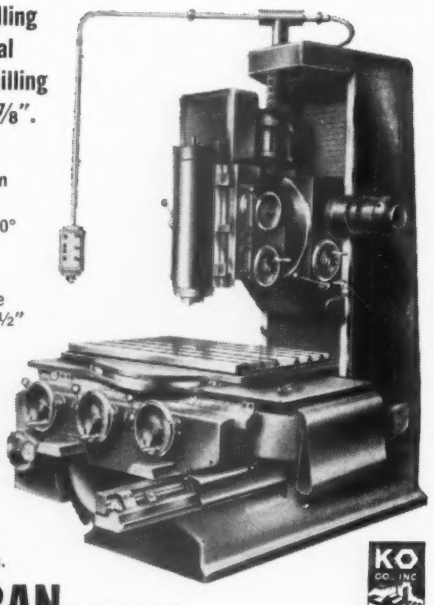
You'd need several machines to do all the different jobs possible on one

BOKOE No. 3 Universal Miller

For non-ferrous, cast iron and alloy steel tooling, patterns and production to close tolerances.

Use it for radial drilling in addition to vertical milling, universal milling and boring up to 11⅞".



- Column swivels 180° in either direction
- Milling head swivels 90° in either direction
- 37½" throat
- Distance between table and spindle head 0-37½"
- Rotary table handles bulky work up to 8'2"
- Weight 7½ tons

Smaller models, too.
Write for complete details.

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38 Exchange Place, Jersey City 3, N. J.

KO CO., INC. INDUSTRIAL IMPORTERS
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★Organization ★Wage Incentives
★Methods Improvement ★Budgetary Controls
★Job Evaluation ★Diversification

WALLEY & ASSOCIATES
SURVEYS • INSTALLATIONS • TRAINING
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Circle 740 on Inquiry Card

GLOSSARY OF FOUNDRY TERMS
Compiled by Ed Bremer, FOUNDRY Metallurgical Editor

This extensive glossary of foundry terms was compiled from a wide variety of sources. Arranged in handy booklet form, it is a valuable reference for every foundryman. 48 pages. **$1.00**

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1213 West Third St., Cleveland 13, Ohio

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"THAT GOOD"
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Phone: ALpine 1-9135

Circle 741 on Inquiry Card

CERRO ALLOYS

expedite and reduce costs of many foundry jobs

Cerro Alloys have properties that make them ideal for pattern shop and foundry use. They melt at low temperatures (117°F to 281°F) and do not shrink in hardening—even expanding slightly. The latter quality is especially valuable in duplicating master patterns for match plates. Other uses are: lining and sealing core boxes; producing patterns compensated for shrinkage; spray metallizing, altering and repairing patterns and core boxes; filling blow holes in castings, etc.
Send for Bulletin F6, "Cerro Alloys in Foundry and Pattern Shop".

CERRO DE PASCO CORPORATION
318 Park Avenue
New York 22, N. Y.

Circle 742 on Inquiry Card

No. 4 DAYTON RING VALVE BENCH RAMMER

MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

Send for Bulletin 300

DAYTON PNEUMATIC TOOL CO.
Manufacturers of Pneumatic Tools Since 1903
DAYTON, OHIO

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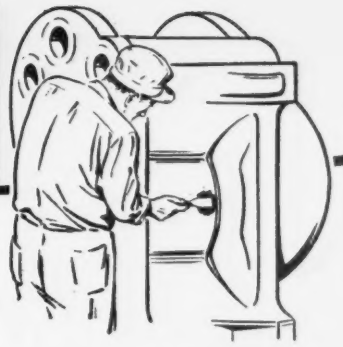

These features mean BETTER LOOKING CASTINGS

TIGHT, LASTING REPAIRS

When correcting blow or sand holes, surface blemishes, or rough and porous areas in castings, you can depend on Smooth-On Foundry Cements, standard of the industry for more than 55 years. They are easy to apply, harden quickly, stay firmly in place.

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With 4 different shades to pick from, you know you can get a close match for your castings.

4AA—Light gray, fine texture
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4B —Dark gray, coarser texture
also
9—Bronze or Brass

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Rigid quality control means you can be sure that the strength and color of Smooth-On Foundry Cements will not vary from one order to the next. Every lot of Smooth-On cements is laboratory tested and must satisfy tests for setting time, hardness, and color before it is packed for shipment.

FREE SAMPLES

Why not try one or more of these Foundry Cements at our expense? We will be glad to send you a free sample of any of the cements described above if you will write us on your business letterhead. Write today, and see how Smooth-On can improve the appearance of your castings.

SMOOTH-ON MFG. CO. DEPT. 17
570 Communipaw Ave., Jersey City 4, N. J.

SMOOTH-ON
FOUNDRY CEMENTS

SO-38P

Circle 744 on Inquiry Card

RESERVE WEIGHT

Assures rapid shakeout on even heaviest castings

The *Foundromatic* shakeout weighs more than 40% of its rated capacity. It's this extra weight that slashes knockout time by providing *vigorous vibration* on *all* loads. Why buy extra capacity? The *Foundromatic* shakeout will give you all the reserve weight you'll ever need for a fast, clean operation.

Sturdy construction cuts maintenance

Free-floating body, including heavy reinforced deck supports and discharge hopper, is a one-piece unit. Entire structure is stress-relieved to provide maximum resistance to shock loads. Heavy flat deck minimizes flask damage. Simplified two-bearing mechanism is not affected by overloads. Oversized bearings afford extra-long, dependable service.

See your A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. Ask for Bulletins 07B6365B and 07B8141.

New Control Eliminates "Stopping Bounce"

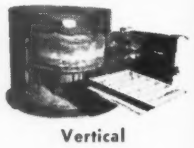
This patented control eliminates mechanical snubbing and the excessive maintenance required by friction checks. Control reverses motor torque of driving motor after speed has been reduced. With torque opposing rotation of mechanism, shakeout is brought to stop before stopping amplitude builds up. Smooth stop prevents damage to castings and flasks . . . prolongs life of motor and drive. A-4966

ALLIS-CHALMERS

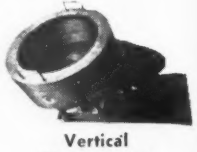
Foundromatic is an Allis-Chalmers trademark.

Circle 745 on Inquiry Card

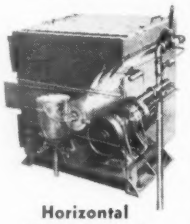
CENTRIFUGAL CASTING MACHINES



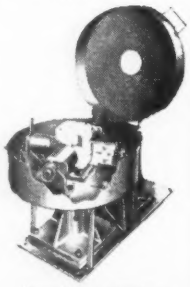
Vertical



Vertical Water-Cooled



Horizontal Water-Cooled



Precision Casting

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.

CENTRIFUGAL CASTING MACHINE COMPANY

P. O. Box 947 Tulsa 1, Okla.

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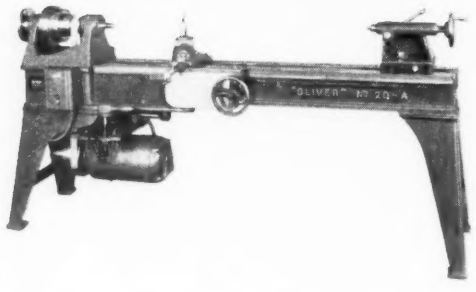
NEW OLIVER LATHE turns large patterns quickly, accurately



Oliver makes a full line of lathes and woodworking machinery for pattern shops.

The Oliver No. 20 Woodturning Lathe is one of a complete line for pattern shops. It embodies the latest engineering developments. It is available in four sizes to swing 16", 20", 24" and 30" over bed. Standard beds are 8' and 10' long—longer beds furnished as an extra. The regular machines have 8 spindle speeds—16 speeds available on special order. Oliver Lathes are used in leading pattern shops throughout the world. Write for Bulletin No. 20.

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Established 1890 **GRAND RAPIDS 2, MICH.**

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CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

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Circle 748 on Inquiry Card

WHAT DO YOU NEED IN A COST METHOD

The simplest and most complete method of costing ever prepared for nonferrous foundries is found in

BASIC COST PRINCIPLES FOR NON-FERROUS FOUNDRIES

(Non-Ferrous Founders' Society Publication)

Up-to-the-minute guide for costing in both small and large foundries. Prepared by practical foundrymen, based on 10 years of research and experience of the industry under Government Pricing Regulations.

Price $5.00 Postpaid

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HIGH PRESSURE AIR-GAS TORCH BURNER WITH EXTRA LONG SWEEP ELBOW AND RETAIN-A-FLAME NOZZLE

Outstanding for drying and preheating refractory linings of induction, indirect or direct arc and fuel-fired rotary furnaces; for vitrification of rammed refractory linings. Offers wide range of heat input from extra low turndown to full high temperature heating. Portable; light weight; easily clamped to furnace with long sweep elbow nozzle inside. Burns any fuel gas with at least 40 p.s.i. compressed air. Also made in oil-burning type. Write for Bulletin 1079.

HAUCK MANUFACTURING CO.
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CLASSIFIED ADVERTISING

Help Wanted

FOUNDRY
SHIFT
FOREMAN

Position available in ferrous industry located in SOUTHERN CALIFORNIA. For man experienced in supervising employees engaged in ramming, pouring and shakeout of large iron castings.

Send resume giving complete job history, description of duties and salary needs to:

BOX 160, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SALES MANAGER

Familiar with stainless steel and high temperature alloys. Technical background preferred. Location western Michigan.

GEORGE & DIX
Management Consultants
FEDERAL SQUARE BUILDING
GRAND RAPIDS, MICHIGAN

FOUNDRY ENGINEER—DRAFTSMEN

For design of foundry sand handling, melting and conveying systems.

BOX 166, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGISTS

Company engaged in basic process and pyrometallurgy requires several men for production, development and quality control who have some experience in one or more of the following: smelting and refining, steelmaking, or electric furnace operation. Excellent opportunities for qualified men. Hospitalization, insurance and pension plan provided by Company. Plants located midwest, north and south. All replies held strictly confidential. Submit detailed resume. Address: Box 106, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXPERIENCED STEEL FOUNDRY METALLURGIST

Wanted for shop producing carbon, low alloy, and high alloy steel castings. Excellent opportunity. Location: Northeast section of the United States. In reply, please send resume of education background and experience, also state salary required. Address: Box 147, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

NONFERROUS FOUNDRY

Needs superintendent to improve operations so that pressure tight bronze castings and aircraft quality aluminum castings are consistently and economically produced. Attractive opportunity in Northern Ohio. Address: Box 167, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ONLY THE BEST

We need competent metallurgist who likes people—therefore enjoys success in technical sales; who knows ferrous melting; who likes to guide his own destiny—therefore aspires to management; who is resourceful, imaginative, creative—therefore above average. Knowledge of tool, stainless, superalloys desirable. Home base will be Detroit area. Tell us about yourself and we'll do the same. Address: **WAI MET, 1999 GUOIN, DETROIT 7, MICHIGAN.**

FOUNDRY ENGINEER

Large alloy foundry in midwest desires foundry engineer. Practical experience in all phases of operation necessary. Possible future to general supervision if capable. Write particulars. Address: Box 134, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

INDUSTRIAL ENGINEER
FOR
BRASS FOUNDRY

Boston plant of national manufacturing concern has vacancy for man with broad training in nonferrous metallurgy and with at least 3 or 4 years' experience in nonferrous foundry operations.

Must be capable of handling all technical operations in connection with foundry problems.

This is a challenging opportunity with respect to shell molding and other modern foundry processes. Write fully giving details of educational background, experience and salary requirements to:

BOX 150, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

DESIGNERS-DRAFTSMEN-ENGINEERS

Experienced in foundry layouts and equipment. Send experience record, personal data, recent photo and references prior to personal interview.

BOX 142 FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED

Maintenance foreman for semi-mechanized foundry. Must be capable of assuming complete charge of department, and setting up a preventative maintenance program. Only man familiar with foundry maintenance need apply. Location: Illinois. Total Employment: 300.

BOX 179, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

W A N T E D
PATTERNMAKER WITH CASTING SALES EXPERIENCE

Need a man between 25 to 40 years of age with patternmaking and casting sales experience. If you have had some experience along these lines, it will be profitable to you to investigate this ad. In your reply give complete qualifications and salary expected. Address: Box 154, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOREMAN

With good knowledge of molding practices in gray iron jobbing foundry, located in Central Indiana. Must plan and direct the work in foundry for the efficient production of quality castings. We produce light and medium high tensile castings on squeezers, rollovers, and side floor. Send resume, age and salary expected. Address: Box 172, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CASTING REDESIGN ENGINEER

An unusual opportunity for a man capable of redesigning weldments and forgings to castings. If you have imagination, mechanical engineering background and technical sales ability, a growing midwest iron and steel foundry organization offers a challenging assignment that will reward results with good salary. Address: Box 161, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDING FOREMAN

Midwest foundry producing carbon and low alloy steel castings has an opening to supervise production of small and medium machine molded castings. Address: Box 170, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDING FOREMAN

For steel foundry. Must know heading and gating for miscellaneous steel castings and be able to instruct trainees. Address: ELECTROCAST STEEL FOUNDRY CO., 4701 W. 15th PLACE, CICERO 50, ILLINOIS.

CHIEF METALLURGIST

For steel foundry in Los Angeles. Excellent opportunity at excellent salary for man experienced with all phases of technical control. Submit personal history and industrial background. Address: Box 174, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

BRASS FOUNDRY SUPERINTENDENT

Must have working knowledge of brass metallurgy, at least 10 years of permanent mold, die cast or sand foundry experience, under 50, salary open. Chicago area. Address: Box 112, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

RESIN APPLICATIONS ENGINEER

Large chemical manufacturer has opening in research and development laboratories located in vicinity of New York City for young chemist, chemical engineer or metallurgist to do applications research and customer service work on the use of thermosetting resins in shell molding and other foundry applications. Experience desirable but not essential.

Forward full resume including salary requirements.

BOX 176, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SUPERINTENDENT

Medium-heavy gray iron foundry wants superintendent. Age between 30 and 40, must have all-around job shop experience and an excellent knowledge of human and employee relations. Located in Midwest.

BOX 131, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CLEANING ROOM FOREMAN

By Foundry making steel castings from 20# to 7500# of Carbon Steel and various alloys with production capacity of approximately 400 tons monthly. Foreman will be responsible for activities of approximately 60 employees. Plant located in Western Pennsylvania. This is a permanent position with a well established company. In reply state age, complete experience and name past employers, and salary expect. Address: Box 173, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN

Opening at once in large Western Pennsylvania gray iron foundry for competent core room supervisor. Nationally-known manufacturer expanding present plant facilities. This is a permanent position. Excellent opportunity for the right man. Please give personal data in detail including age, experience, present compensation, etc. Include recent photo if available. All replies will be treated confidentially. Address: Box 164, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

Technically trained with malleable experience for well established progressive, jobbing and semi-production foundry in middlewest employing 150 men. Capable of supervising batch type air furnace melting, annealing and laboratories. Submit application including personal data, resume of qualifications and experience, references and salary expected. Address: Box 162, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

Midwest company operating large jobbing iron foundry specializing in alloy irons including Ductile wants man for metal and sand control. Ground floor opportunity with sound growing company. Prefer man with foundry background. Address: Box 159, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ELECTRICIAN—ASSISTANT TO CHIEF

General maintenance of electrical equipment and instruments in steel foundry that employs 650. Applicant must have knowledge of basic electronics, engineering degree preferred but not essential. Foundry experience necessary. Should be familiar with arc furnace, rectifier type welders, pyrometers and recorder controller instruments. Address: Box 171, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

Experienced on mechanized operation to supervise new rollover and strip mechanized line in established Eastern Foundry. State age, experience and salary requirements. Address: Box 178, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

Experienced cleaning room foreman. Production gray iron foundry making small castings. Address: Box 152, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Employment Service

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.

Confidential Inquiries Invited

From Employers and Qualified Applicants.

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **HARRISON 7-8600**

JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

SALARIED PERSONNEL

$5000-$30,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, P.O. BOX 674, MANCHESTER, VERMONT

Positions Wanted

FOUNDRY SUPERINTENDENT

Thirty-three years' practical experience, ferrous and nonferrous, jobbing and production, fully qualified to take complete charge of all foundry operations, mix metals by analysis, iron, semi-steel, ductile iron, brass, bronze, copper, aluminum in green sand, dry sand, semi-shell and shell molding. A-1 in plaster molds and cores. Capable to handle pattern shop. Address: Box 129, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR GENERAL FOREMAN

Thorough knowledge of all phases of nonferrous metals. Practical man, 36 years' experience, molder, foreman, superintendent, well versed all departments. Available immediately. Address: Box 109, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Due to forced age retirement from present connection I would like to contact a foundry organization that could use my years of supervision experience in jobbing and captive foundries. Thorough in all phases of foundry operation. Address: Box 120, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER SUPERINTENDENT

Practical gray iron foundryman, age 52, graduate Metallurgist, technically trained with broad background of experience in jobbing, machine tool, paper machinery and high production. Well versed in metal, sand control, molding, cores, costs, etc. Low scrap record also low production costs. Desire connection with reliable firm demanding results. Address: Box 151, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN OR SUPERINTENDENT

Thirty-three years' practical experience, 20 years as supervisor in both jobbing and high production shops. Experienced in rigging and gating for fast production and quality castings, both gray iron and nonferrous metals. Address: Box 163, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

REPRESENTATIVE AVAILABLE

Established sales representative experienced in the manufacture and design of steel castings with clientele of good customers desires steel casting connection for sales in the Cleveland, Ohio area. Address: Box 155, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

INDUSTRIAL SALESMAN

Experienced in all phases shell molding. Desire position in shell mold equipment or resin sales to Midwestern foundries. Address: Box 148, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

REPRESENTATIVE AVAILABLE

Desire additional lines on commission basis. Presently selling to leading foundries in Michigan and northern Indiana. Address: Box 157, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Twenty-five years' experience in all phases of this work. Ferrous and nonferrous castings. Free to locate anywhere. Address: Box 146, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT OR GENERAL FOREMAN

Gray iron or nonferrous. Prefer small to medium shop, jobbing or production. Practical man, thirty years' experience, molder, foreman, superintendent. Well versed all departments. Available immediately. Address: Box 181, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunity

PERMANENT MOLD METHOD AVAILABLE

THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

PARTNER WITH EXPERIENCE!

Patternmaker with 15 years of practical and technical experience in wood and metal pattern-making, molding, precision plaster and investment casting, design of pattern and permanent molds wants cooperation in partnership with small nonferrous foundry or patternshop. Give detailed information. Address: Box 153, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultant

ELECTRIC FURNACE CONSULTANT BASIC AND ACID PRACTICE

Supervisor on electric furnaces for 35 years. Thorough knowledge of:

1. All kinds of plain carbon and alloy steel.
2. Analysis control.
3. High standard of physical properties.
4. Low Cost with high productivity.

EUGENE H. WEAK **2933 HIGHWAY AVE.**

HIGHLAND, IND. **PHONE: TEMPLE 8-1244**

Representatives Wanted

WANTED

Sales representative to handle the sale of ceramic strainer cores and small refractory specialties for foundry trade. Territory open: New York State, Eastern Pennsylvania, Southwestern Ohio, Massachusetts, Connecticut, New Jersey, Maryland, Virginia and Missouri.

BOX 168, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

SALES REPRESENTATIVE

Three primary foundry areas need effective sales coverage—Michigan, Ohio, and Western Pennsylvania. We are manufacturers of mold handling, and sand conveying equipment. Representatives handling equipment and with foundry and engineering experience are desired. Address: NOMAD FOUNDRY EQUIPMENT DIVISION of WESTOVER CORPORATION, 3110 W. FOND DU LAC AVE., MILWAUKEE 10, WIS.

Open Capacity

OPEN CAPACITY

Gray Iron, Cope and Drag Patterns also Squeezers.

PHARISBURG FOUNDRY CO.

MARYSVILLE, OHIO

RFD #1 **PHONE 21142**

Wanted-To-Buy

WANTED TO BUY
THE FOLLOWING USED LABORATORY EQUIPMENT IN GOOD CONDITION

1—Universal Sand Strength Machine
1—Laboratory Drying Oven
1—Muffle Furnace
1—Ro-Tap Sieve Shaker or 1—Combs Lab Sifter
1—Gas Determinator
1—Laboratory Mixer
1—Analytical Balance
1—Clay Determinator

Send full information to:

BOX 169, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

WANTED TO BUY

Tractor Sandslinger, Size 11'—13' with magnetic separator.
Core Ovens—Battery of two, transrack, oil fired recirculating air heating system. Minimum size 14' wide x 15' long x 7' high. Give description, age and conditions.

THE EASTERN FOUNDRY CO.

BOYERTOWN, PA.

WANTED TO BUY

1—Tablast, 9' Plain Table, w/Elevator. Must be late model and in good condition.

PITTSBURGH METAL PROCESSING CO., INC.

1850 CHAPMAN STREET

PITTSBURGH 15, PENNSYLVANIA

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Osborn-Rota-Lift Molding Machine, Model 3161. Address: Box 158, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundries For Sale

FOR SALE
OR LEASE

Land and Buildings
of
THREE RIVERS CASTING CO.
Three Rivers, Michigan
BARGAIN AT $55,000.00

Brick and concrete block and steel construction, concrete floors; 28,000 square feet. Served by New York Central RR and Michigan Central RR. Lloyd-Thomas Appraisal $175,000.00 plus land. Oil fired boiler; overhead heating units; sprinkler. With or without foundry equipment. Immediate possession. Complete details upon request.

BOX 177, FOUNDRY

PENTON BLDG. **CLEVELAND 13, OHIO**

CLASSIFIED ADVERTISING

Foundries For Sale

PROFITABLE ALUMINUM FOUNDRY
$40,000.00 back orders—small overhead and operation—only permanent mold jobbing foundry and sand casting shop in the Southeast—heat treat furnace—L-N Tape Recorder—controlled holding furnaces—sales force will continue on 5% commission—all personnel will remain—This plant has unlimited possibilities and income—Priced for quick sale. Confidential. All replies answered. Address: Box 149, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

FOR SALE

From foundry dismantling job at Chambersburg, Pa., the following building and equipment, offered at bargain prices for quick disposal:
Industrial Steel Building, 80' x 320', w/80' span overhead bridge crane, 50 ton capacity, w/15-ton aux. hoist, complete with runways; and 15-ton 48' span overhead bridge crane w/200' runway.
1—Whiting #4 cupola.
1—Whiting #9 cupola w/85 HP motor and 10,500 CFM blower.
1—Whiting #9 cupola w/50 HP motor and 6,000 CFM blower, complete with controls.
3—air furnace blowers and burners.
3—100 KVA transformers 2200/220/440, single ph., 60 cycles, Serial #10023-24-25.

GLOBE DISMANTLING CORPORATION
P.O. BOX 2000
GLASSPORT, PENNSYLVANIA
PHONE ORchard 8-6141

FOR SALE

#24 Gardner Horizontal Disc Grinder, 53" Dia. table; ball bearing 30 HP 3/60/220 motor in base; wheel dresser; 8 new sets grind discs; $1250.00.

Kane & Roach Core Wire Straightener, motorized, late; $350.00.

SEABOARD STEEL CO., INC.
NEW HAVEN, CONN.

FOR SALE

1—Ingersoll-Rand 40 H.P. Cent. Blower air weight controls.
1—Ingersoll-Rand 10 H.P. 16 oz. Cent. Blower.
1—Standard Grinder 220 V. AC 15 H.P. 20 x 2 x 2 wheels.

BARNETT FOUNDRY & MACHINE CO.
LYONS AVE. & COIT ST.
IRVINGTON, N. J.

SAND BLAST EQUIPMENT

Bought	Sold	Traded
48 x 48	Wheelabrator	$5000.00
42 x 48	Wheelabrator	2500.00
36 x 42	Wheelabrator	3000.00
27 x 36	Wheelabrator, rubber or steel belt	3000.00
15"	Continuous Wheelabrator	2000.00
36"	Continuous Wheelabrator	6000.00
6'	Flat Table Wheelabrator	2500.00
9'	Pangborn L.F. Table	4000.00
6'	Pangborn Air Table	975.00
3½	GK-2 Pangborn Barrel	1000.00
1½	Cu. Ft. Pangborn Air Barrel	200.00
ES-421	Pangborn Shell Machine	800.00
Pangborn Twin Table Room, Model 67, Type N, size 17½ x 16½ x 10		2500.00
14GK2	Pangborn Rocker Barrel	2500.00
#2	American Table	1500.00
Tumbling Barrels, Horizontal or Vertical		125.00
Vapor Blast, Cabinet		600.00
Hand Cabinets, Dust Collectors, Pressure Tanks, Rooms. All Types and Sizes.		

DIAMOND SAND-BLAST, INC.
5654 W. JEFFERSON
DETROIT 9, MICHIGAN
PHONE: VI-36750

FOR SALE

1—#85 Wheelabrator Dust Collector. Complete, in very good condition. Address: HUTCHINSON FOUNDRY PRODUCTS, 4131 ALBY STREET, ALTON, ILLINOIS.

For Sale

FOR SALE

We have the best selection of HARD CHROME REBUILT PNEUMATIC TOOLS WE HAVE EVER HAD.

Ingersoll-Rand Size 24 Floor Rammers
Ingersoll-Rand Size 14 Bench Rammers
Cleco Bench Rammers
Chipping Hammers—All types
Core Breakers and Grinders

Our prices are about half the cost of new tools. All tools sold by us are guaranteed and can be returned if found not satisfactory.

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVE., DAYTON, OHIO
TELEPHONE: MADISON 2701

FOR SALE

1—Blakeslee Model DP Degreaser. Used for two weeks.
1—Custom Blakeslee—Model TE-YP Vapor-Spray type-boiler and still, pumps and tanks included. Suitable for high production.
1—Victor-Peninsular gas fired continuous drawing furnace with motors, controls, conveyor feed, etc.

All in excellent condition.
Immediately Available.
Information on request.

MR. G. FORWARD
OTTO BERNZ CO., INC.
280 LYELL AVENUE
ROCHESTER 6, N. Y.
PHONE: GLenwood 9063

FOR SALE

MOTORS—GENERATORS
TRANSFORMERS
Unused — Rebuilt
WORLD'S LARGEST INVENTORY

ELECTRIC EQUIPMENT COMPANY
Phone Station Collect GLenwood 6783
P.O. Box 51—Rochester 1, New York

FOR SALE

One—6' (plain) American Wheelabrator Tablast complete with controls, 440 volts, 60 cycle, 3 phase.
One—Osborn Jolt Squeeze Molding Machine 276-J, Serial No. 10433-W, 26" x 20" table, 22" throat, 16" x 22" squeeze plate complete with air valves.

THE ST. MARYS FOUNDRY COMPANY
ST. MARYS, OHIO

FOR SALE

1—Simpson Mixer, #2, 20 HP motor.
Miscellaneous: Screens, Pulverizers, Grinders, Tyler Rotap Screens, etc.
Wanted: Your Idle Machinery.

OUR 39th YEAR.

CONSOLIDATED PRODUCTS CO., INC.
66 BLOOMFIELD STREET
HOBOKEN, NEW JERSEY
HO 3-4425 N. Y. TEL. BA. 7-0600

FOR SALE

1 two ton electric arc furnace, complete, less transformer and panel board. Cheap and quick removal.

BOX 165, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

For Sale

1/3 OF
NEW PRICE
HYDRAULIC SKID TRUCKS

3 only—Yale, 4000 lb. capacity, 3" lift, platform, 11" x 26" x 48". New price $500.00.

SPECIAL PRICE $155.00 EACH

2 only—Lewis Shepard, 8000 lb. capacity, 5" lift, platform, 11" x 27" x 72". New price $800.00.

SPECIAL PRICE $285.00 EACH

ALL REBUILT AND GUARANTEED LIKE NEW. RENTALS WILL APPLY TO PURCHASE.

MOBILE INDUSTRIAL EQUIP. CORP.
TIOGA & 9TH STS. PHILADELPHIA 40, PA.
CALL: BAldwin 6-1200

FOR SALE

TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
8375	20oz.	Spencer	380	16oz.	No. Am.
6000	32oz.	Ing.-Rand	340	20oz.	A-B
4700	32oz.	Ing.-Rand	320	12oz.	Spencer
2500	7oz.	Sturt.	9000	6"SP	Northern
1300	16oz.	Spencer	3420	8"SP	N.Y.
800	13oz.	Buffalo	2700	⅝"SP	Ilg
400	12oz.	Buffalo	2500	½"SP	American
450	7oz.	Spencer	1100	4½"SP	Bayley
400	16oz.	No. Am.	2344	2"SP	Clarage

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE

Combination Ransohoff tumbling unit—complete with 48" x 60" cut down barrel, 4'2" x 48" rinse and dry machine and vibrating hopper 12 cu. ft. capacity—3/60/220 V. Gas heat 800 BTU with motors and controls. Excellent condition. Complete specifications upon request. For information contact:

M. COOPER
1759 WEST GRAND AVE.
CHICAGO, ILLINOIS

FOR SALE

27" x 36" WHEELABRATOR, RUBBER BELT
84" SWING TABLE WHEELABRATOR (1951)
#-3 MULTI TABLE WHEELABRATOR, 10' TABLE WITH (4) 48" REVOLVING TABLES. (1952)
100-TONS STEEL SHOT SAE-280 (.028) APPROX. DIA.

BOX 156, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

USED EQUIPMENT FOR SALE

One sandblast booth, 10' x 11', with sand pot, blower, sand collector.
Sly 30/48 blast cabinet and dust filter C-8330.
315 cu. ft. horizontal Ingersoll Rand compressor, 60 H.P., G.E. motor, all controls.
Vapor degreaser, 88" x 48" x 93" high.

BOX 175, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE

1—#550 Reda melting furnace, serial #1018-351; complete with blower and motor; used, in good condition. One extra set of linings, new. Total price $2000.00. F.O.B. Baltimore. Address: ARLINGTON BRONZE & ALUMINUM CORP., 4700 E. WABASH AVENUE, BALTIMORE 15, MD.

FOR SALE

Completely overhauled Roots-Connersville Blower, 3200 CFM; maximum capacity. Will sell for $750.00. Motor not included. Also offer #6 Branford Shakeout for $100.00 and a #8 for $150.00. All prices stated are F.O.B. Alpena, Michigan. Address: THUNDER BAY MFG. CORP., P.O. BOX 317, ALPENA, MICHIGAN.

For Sale

FOR SALE

MOLDING MACHINES
1—Tabor 22" Power Jolt, Rollover, Draw, Portable, 22" x 32" Table.
1—Herman, Jolt, Rollover Draw, 6000#, 40" x 60" table.
2—International, Jolt, Rollover Draw, 24" x 10G, Stationary.
2—No. 275 Osborn jolt squeezers. Stationary.

CORE OVENS
1—Coleman Recirculating 3 section with 5 drawers per section. Gas fired.
1—Coleman Recirculating 4 section with 5 drawers per section. Gas fired.
1—Forbeck Recirculating, gas fired, double end, thru-drawer type.

BLOWERS FOR CUPOLAS AND FURNACES
1—Connersville Rotary Blower, 3500 CFM.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
2—Connersville Rotary 14" x 27" HD, 2750 CFM at 5# press.
1—Connersville rotary blower 22 x 66 45 cu ft per revolution 9000 CFM.
Maxson-Premix Blowers for Gas ¼ to 1 HP.
2—2 HP 20-oz. Spencer Turbine Blowers.
1—Spencer Turbine Blower, 2700 CFM, 27 oz., 30 HP, 3/60/220-440 V.

METAL MELTING EQUIPMENT
1—1000# open flame brass melting furnace, gas fired.
1—Hausfeld Stationary Brass, oil or gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# Al, Cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.

MISCELLANEOUS
1—Pangborn 1 to 4 nozzle air blast generator, complete.
1—Sly Tumbler 24" x 40".
1—International SB-11 core blower.
2—Pangborn cloth screen collectors, 2 HP.
1—Stoney crane type shakeout.
1—NPD Royer sand separator.
1—#16 Roto-clone unit complete.
Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

SHELL MOLDING MACHINE

Completely automatic Sutter with 20 x 30 inch pattern plate. A War Horse for continuous production but allowing for quick pattern changes. Push Button controls giving operator (male or female) time to set cores and close molds ready for pouring. Each cycle can be individually timed. Machine is equipped with gas shell baking oven and either gas or electric pattern heat. Sold either with or without Selas Type 60—C-3 gas compressor and mixer with 3 h.p. 220 volt, 60 cycle motor.
Need room for our expanding warehouse operation and will sacrifice.
Offered subject to prior sale.
Phone, wire or write:

KENCROFT MALLEABLE CO., INC.
373 HERTEL AVENUE
BUFFALO 7, N. Y.
PHONE: RIverside 1520

FOR SALE—NEVER USED

1—B & P Super Hydra Slinger-First Arm 8', Ramming Arm 5', 5" tip—220/3/60 Hydraulic Controls

1—10 ton Roto Feed 220/3/60

Offered for immediate delivery at 10% off new price.

Located—East Coast. F.O.B. Shipping point.

BOX 180, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

For Sale

FOR SALE

JOLT ROLLOVER MOLDING MACHINES

#918 Johnston & Jennings—44" x 54"; 18" draw; no pit required	$1250.00
#2047-4 Osborn, 18" x 24"; stationary; 1942	275.00
#601 Osborn; 750 lb. cap.; 30" flask...	350.00
#602 Osborn; 750 lb. cap; 36" flask...	450.00
#605 Osborn; 750 lb. cap; 54" flask...	650.00
Tabor 30" x 40"; extends to 69"; 12" draw, shockless type; 1500 lb cap. ...	950.00

JOLT STRIP MOLDING MACHINE

#559 Osborn—25 x 30; 1200 lb. cap....	550.00

JOLT SQUEEZE STRIP MOLDING MACHINES

#143 Milwaukee	350.00
#163 Milwaukee	450.00
Nichols—Type B; 14" cyl. 14" x 36"...	250.00
#211 SPO	550.00
#213 SPO—19 x 26; 4½" jolt cyl.; 13" sq.	750.00
#2114 SPO—14 x 24; 11" sq. cyl.	650.00
#2136 SPO—13" sq. cyl.	750.00
#720 U Osborn—31 x 44; 11" sq. cyl..	550.00
International—PKL—14 x 5½"	650.00

JOLT SQUEEZERS

Nicholls—Type D	250.00
Osborn—#275 J 16 x 20; 10" sq. cyl....	275.00
Osborn—#276 J	350.00

PUSH OFF MACHINES

Champion—Model LLA-45; 45 x 26" used with sandslinger	350.00
International; Model LP-Portable Pin Lift; 30 x 40 used with sandslinger..	350.00

CORE BLOWERS—CORE ROLLOVERS

#193 Osborn—for med. cores	650.00
#94 Osborn—for large cores	750.00
Osborn Hand Rollovers—Model 42.....	100.00

MATERIAL HANDLING EQUIPMENT

Model HA Hough Payloader	1000.00
Clark Fork Lift Truck—6000 lb	1000.00
Elwell Parker Fork Lift Truck—4000 lb	1000.00
Mercury Fork Lift Truck—2000 lb. Elec.	1000.00
Lewis-Shepard Platform Lift Trucks....	150.00

FURNACES

Stroman—2000 lb. Tilting Hydraulic....	1500.00
Fisher—2000# Aluminum	2000.00

CORE OVENS

Dielectric—Model 900A and 1800A. Set up in your shop in operating condition. Less than ½ new price	12,000.00

MISCELLANEOUS FOUNDRY EQUIPMENT

U. S. 7½ H.P. 3 speed grinder; 28" wheel	450.00
Model S B & P Screenerator	225.00
Royer Screenerator	250.00
Climax Wire Straightener	400.00

FOR THE BEST DEAL CALL
BALCHER MACHINERY COMPANY
695 E. 152nd STREET
CLEVELAND 10, OHIO
TELEPHONE: GLENVILLE 1-2474

FOR SALE

Wheelabrator 48/42 skip loader and dust collector
Wheelabrator 20/27 rubber belt, collector if desired
Pangborn 3½ cu. ft. Roto Blast (wheel type)
Pangborn 1½ cu. ft. Roto Blast (air type)
Pangborn, American and Ruemelin Dust Collectors
Pangborn and Ruemelin hand blast cabinets
2—Pangborn dust collectors, #223CK, 3000 CFM, 7½ HP motor, 3 years old, used 2 years. Guaranteed in every way. One-half of new price.
We buy and sell heat treat and sand blast equipment.
All above items and many more in our shop.

F. D. RICHARDSON & CO.
12925 AUBURN AVENUE
DETROIT 23, MICHIGAN
PHONE: BROADWAY 3-9124

FOR SALE

Detrex Degreaser, Model USS00-S, Size 84-36-36 with 2 baskets. Purchased January 1955. Like new. Three Osborn Drag Molding Machines, type 332-49.

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

HAVE YOU EVER NOTICED the numerous types of headings under which classified ads are listed? Whether interested in obtaining qualified personnel, selling used machinery, wanting to buy equipment, or are yourself looking for a better position, you should seriously consider advertising in the classified section of FOUNDRY MAGAZINE.

•

FOUNDRY has 45,000 readers which cover the entire foundry industry. That means that for a nominal sum you get the widest possible coverage of the industry and your advertisement reaches "just the right people".

•

The Classified Staff is equipped to handle all details in the placement of your ad.

Classified

ADVERTISING DEPT.
FOUNDRY
CLEVELAND 13, OHIO

AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR COMPRESSORS

1—CHICAGO-PNEUMATIC Size 7½ x 6 Single Stage horizontal, 20 HP Motor, Starter etc, 220/440 volts.
4—GARDNER-DENVER Model ADR, 4" stroke, 15 HP Motor & electrical 220/-440/3/60 cycles 125 PSI pressure, w/-storage tanks. New in 1950's.
1—SULLIVAN Type WN-3 size 20" x 12" x 14", 1220 CFM, 250 HP, AC Motor

AIR HOISTS

75—INGERSOLL RAND RC-5, 500 lbs.
10—INGERSOLL RAND LC-7, 700 lbs.
3—INGERSOLL RAND Size "AN" 500 lbs.
6—INGERSOLL RAND Size "BN" 1000
1—INGERSOLL-RAND size "D", 4,000 lbs.
1—INGERSOLL-RAND size "D6", 6000 lbs.
1—INGERSOLL-RAND size "E", 10,000 lbs.
15—DETROIT, 1 and 2 ton cap.
15—APPLETON air hose reels, swivel base, 50', and 75 capacities.

ELECTRIC HOISTS

1—Comet 1000 lbs, capacity.
1—SHAW Box 1000 lbs. capacity.
2—SHAW BOX 6000 lbs. cap. Lo-Head room, AC 3/60/220/440 volts.
1—DETROIT 10,000 lbs. cap. Model LHR, AC, 3/60/220/440 volts.

BUCKET ELEVATORS

1—LINK BELT 30' Centers, 10" x 7" Buckets, w/Motor and Drive.
1—LINK BELT 35' Centers, 12" x 7" Buckets, w/Motor and Drive.
2—LINK BELT 40' Centers, 14" x 7" Buckets, w/Motor and Drive.
1—LINK BELT 50' Centers, 16" x 8" Buckets, w/Motor and Drive.

CUT-OFF MACHINES

1—DEWALT model ME2 cut-off saw, 10 HP motor, 24" Carboloy blades.
1—TABOR model C10AF, Abrasive Disc, 16" Wheel, 10 H.P. Motor.
1—GROB Band Saw, Type OS-36, open end, 36" throat, MD.
3—TESSMER Model "H" & "I" Sprue Cutters.

CORE WIRE AND ROD STRAIGHTENERS

1—AMERICAN Type D, Pneumatic ¾" Straightener, 1¼" Shear.
2—OLIMAX #2, 2A, 1/16" to ¼".
1—CLIMAX #3, ¼" to ⅜", Length 10".

CORE GRINDERS

2—MILWAUKEE Rotary Type, Model 70-12, 70" Dia. Table, Very Late.
1—STONEY core grinder, 16" dia. wheel, 48" travel, 5 HP AC motor.

CORE BLOWERS

2—CHAMPIONS CB 10, Max. Core 10 lbs.
2—CHAMPIONS CB 400, Max. Core 300.
1—DEMMLER No. 55 Max. Core 6 lbs.
1—DEMMLER No. 1, Max. Core 10 lbs.
1—DEMMLER No. 1-E, Max. Core 10 lbs.
2—DEMMLER No. 2K, Max. Core 20 lbs.
2—DEMMLER No. 2E, Max. Core 20 lbs.
2—DEMMLER No. 2, Max. Core 20 lbs.
2—DEMMLER No. 3, Max. Core 35 lbs.
2—DEMMLER No. 3K, Max. Core 35 lbs.
2—DEMMLER No. 3E, Max. Core 35 lbs.
1—DEMMLER No. 4, Max. Core 100 lbs.
1—DEMMLER No. 4E, Max. Core .. lbs.
2—INTERNATIONALS No. SB, 11 Max. Core 15 lbs.
2—INTERNATIONALS No. SB 13, Max. Core 30 lbs.
2—OSBORN No. 92, Max. Core 35 lbs.
2—OSBORN No. 192, Max. Core 50 lbs.
2—OSBORN No. 193, Max. Core 75 lbs.
6—MILWAUKEE TACCONE Model A-3, Max. Core, 4 lbs.

CORE OVENS

1—INDUCTION Heating Dialectric, Model M-800A, 600 lbs. per Hr. New.
1—INDUSTRIAL "Revolving Carriers" Continuous, Trays 18" x 80", Gas Fired.
1—YOUNG BROS. 2-Comp. 10 Drawers, Overall 9' x 12' x 8', Gas Fired.
1—MAEHLER SINGLE COMPARTMENT I.D. 96" L x 80" W x 84" High, Gas Fired Recirculating, L & N Controls.
2—DIETERT #500 LAB DRYING TYPE.

CUPOLA BLOWERS & ACCESSORIES

1—ROOTS CONNERSVILLE, Size 20 x 44, 7000 CFM, Type HD, 50 HP Motor.
4—LINDBERG Centrifugal Blowers 2100 CFM, with 15 HP Motors.
1—BASIC REFRACTORIES BRI Gun, Model 110, For cupola lining
5—WHITING 42" Dia. Charging Buckets.
1—CUPOLA Bondactor. For lining.
1—I & R Single Stage FS-367, 100 HP, 9400 CFM.

DUST COLLECTORS & ROTO-CLONES

1—AMERICAN Air Filter No. 12, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 14, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 27, Type W, arrangement "C," with Sludge Ejector.
2—AMERICAN Air Filter Type N, Size 10 with Bench. For Grinding.
1—AMERICAN Air Filter Type N, Size 24, 24,000 CFM, 75 HP Motor.

ELECTRIC ARC MELTING

2—DETROIT Rockers, Indirect Arc, Type AA, 750-1000 lbs. capacity. Complete with 200 KVA Transformers, Control Panels, Automatic Electrode Holders.
2—DETROIT Rockers. Indirect Arc, Type AA, 1000-1500 lbs. capacity. Complete with 250 KVA Transformers, Control Panels, Automatic Electrode Holders.

GAS & OIL FIRED FURNACES

1—LINDBERG FISHER Model MNP, Size 225, Electric Tilt, with Motor & Blower.
2—LINDBERG-FISHER Model MNP, size 300, electric tilt, with motor and blower.
1—LINDBERG-FISHER Model MNP, size 400, electric tilt, with motor and blower.
6—LINDBERG FISHER Model MNP, Size 1700, Electric Tilt, with Motor & Blower.
3—LINDBERG FISHER Model MNP, Size 2400, Electric Tilt, with Motor & Blower.
2—LINDBERG FISHER, Type BB1, Size 25, Hand Tilt, with Motor & Blower.
12—LINDBERG FISHER, Model SSH, Size 550, Stationary, Motor & Blower.
6—LINDBERG FISHER, Model SSH, Size 150, Stationary, Motor & Blower.
3—LINDBERG FISHER, Model SSH, Size 60, Stationary, Motor & Blower.
10—CAMPBELL HAUSFIELD, Stationary, Size 125 to 250,Motor & Blower.
2—CAMPBELL HAUSFIELD, Model 1PNT, Size 2000 lbs., Electric Tilt, with Motor & Blower.

GRINDERS—SWING FRAME

1—MARSHKE, 12" x 2", 3 HP.
1—MARSHKE, 20" x 10", 10 H.P.
2—FOX, No. 6, 24" x 10", 15 HP.
1—MARSHKE 24" x 10", 15 HP motor.

GRINDERS—SNAGGING

3—U. S. ELECTRICAL, No. 65, 24" x 3" x 12" Wheel, 15 HP, 4-Speeds.
3—U. S. ELECTRICAL, No. 65, 30" x 4" x 12" Wheel, 20 HP, 4-Speeds.
2—U. S. ELECTRICAL, No. 64, 14" x 3" Wheel, 7½ HP, 4-Speeds.
1—HAMMOND, Model WR-1, 24" x 3" x 12" Wheel, 10 HP.
2—SAFETY RITES, No. 174, 24" x 3" x 12", 10 HP.

GRINDERS—DISC

1—QUEEN CITY, Model 100 Double End Disc Grinder, wheel size 20" x 2" x 2", with 10 HP Motor.
1—U. S. ELECTRICAL TOOL, No. 80, Double End Disc Grinder, Wheel size 16" x 3", with 7½ HP Motor.

HEAT TREAT FURNACE

2—LINDBERG, Model 4860 GH, Gas Fired 48" x 60", Recirculating, with L & N Controls to 1250° F.
1—LOFTUS ENGINEERING CORP. Annealing, Walking Beam Type, Gas Fired. 1600°, Recirculating, 10' x 12' x 40'.
1—AJAX MFG. Electric, ID 54' Long, 46" Wide, 36" High, 800°. Single Phase..

LADLES

12—MODERN pouring devices, Models F-9 and FA-9, with tapered covered ladles. 400 to 800 lbs. capacity.
3—WHITING Cylindrical, 275 lbs. 19" x 26".
2—MODERN Cylindrical, 1500# 20" x 30".
1—MODERN mixing, 44" x 44", on wheels, 4000 lbs.
2—STEVENS Cylindrical, 2450 lbs. 29½" x 41½".
12—WHITING Lip Pour, 1200 lbs., 23" x 23".
6—MODERN Lip Pour, 1600 lbs. 24" x 24".
2—WHITING lip pour, 2000 lbs. 29" x 29"
3—WHITING Lip Pour, 4000 lbs., 32" x 32".
1—WHITING Lip Pour, 6000 lbs., 36" x 36".
3—WHITING Lip Pour, 5000 lbs., 34" x 34"
2—WHITING lip pour, 7000 lbs. 41" x 41"
1—WHITING Lip Pour, 8000 lbs., 44" x 48".
2—WHITING Lip Pour, 10 ton 62" x 62".
1—WHITING teapot. 4000 lbs., 32" x 32".
1—WHITING lip pour, 40 ton capacity

MOLDING MACHINES JOLT SQUEEZERS

2—MILWAUKEE No. 123, 12" cyl., stationary.
2—MILWAUKEE No. 104, 10" cyl., portable.
6—MILWAUKEE No. 181, 18" squeeze cyl. 24" x 36" table
8—OSBORN No. 275 JW, Straddle Type, 10" Cyl., Portable.
16—OSBORN No. 275J, 10" Cyl., Portable.
3—OSBORN No. 276J, 12" Cyl., Portable.
6—OSBORN No. 210 PJ, Swing Back Head, 10" Cyl., Stationary.
6—OSBORN No. 212 PJ, Swing Back Head, 12" Cyl., Stationary.
1—CHAMPION No. JS-10-P, 10" Cyl., Swing Back Head, Portable.
20—SPO No. 110J, 10" Cyl., Portable
6—TABOR 10" cyl. portable and stationary models.

JOLT ROLLOVER PATTERN DRAW

1—DAVENPORT No. 28 SA, 29" x 40" table, 1500 lbs. cap. 12" draw.
1—DAVENPORT No. 34 SA, 34" x 48" table, 2500 lbs. cap., 15" draw.
1—DAVENPORT No. 28R, 34" x 48" Table. 12" Draw.
1—DAVENPORT No. 40-SA, 42" x 50" Table, 3000 lbs. Jolt, 18" Draw.
1—DAVENPORT model 24SA, 24" x 30" table, 12" draw, 1200 lbs. capacity.
1—HERMAN #6000 Series, 42" x 78" Table, 6000 lbs. Jolt Cap., 20" Draw
1—HERMAN #1500 Series, Table 26" x 30", Jolt 1500 lbs.
1—HERMAN #750 Series, Table 20" x 30", 750 lbs. Jolt.
2—HERMAN #4000 series, 40" x 60" table, 13" jolt cyl.; 4000 lbs. cap.
2—HERMAN #10,000 series, 60" x 84" table, 10,000 lbs. cap. 20" jolt cyl.
6—INTERNATIONAL "R" Core Rollovers.
1—INTERNATIONAL "G" Size 20" x 8".
1—INTERNATIONAL "G" Size 24" x 10".
1—INTERNATIONAL "G" Size 30" x 12".
1—INTERNATIONAL RES, Size 15" x 8".
1—INTERNATIONAL Type "F," 31" x 54", Draw 16", Jolt Cap. 2500 lbs.

WRITE FOR OUR COMPLETELY NEW CATALOG OF USED FOUNDRY EQUIPMENT.

AAA MACHINERY & EQUIPMENT CO.

15539 SARANAC ROAD — CLEVELAND 10, OHIO — CALL LI. 1-6545

AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

4—JOHNSTON & JENNINGS model 918, 44" x 54" table, 20" draw, 2000 lbs. cap.
1—JOHNSTON & JENNINGS 815-B table 30" x 40", draw 15", jolt 1500 lbs.
1—MILWAUKEE #167, Table 32" x 33", Draw 12", Jolt 1000 lbs., Sq. Cyl. 16".
1—MILWAUKEE 217 table 35" x 41", sq. cyl. 16", draw 12", jolt 1200 lbs.
1—MILWAUKEE Model 60B-3, 60" flask, 18" draw.
10—OSBORN No. 40 and 42, Hand Core Rollovers, 18" x 8" Draw.
1—OSBORN No. 342, Table 23" x 38", Draw 10", Jolt 1000 lbs.
1—OSBORN No. 442, Table 21" x 31", Draw 10", Jolt 600 lbs.
1—OSBORN No. 242W, Table 29" x 42", Draw 19", Jolt 1500 lbs.
2—OSBORN No. 405, Table 57" x 64", Draw 26", Jolt 3000 lbs.
6—OSBORN No. 601, 30" wide Flask, 10" Draw, 750 lbs. Jolt.
6—OSBORN No. 602, 36" Wide Flask, 10" Draw, 750 lbs. Jolt.
2—OSBORN No. 332, Flask Size 26" x 36", Draw 9", Sq. Cyl. 16", 1500 lbs. Jolt.
1—SPO No. 413D, Table 24" x 25", Draw 10", Jolt 600 lbs., Sq. Cyl. 13".
1—SPO No. 507, table 32" x 40", draw 10" to 20", jolt cap. 1500 lbs.
1—SPO model 506, portable, 24" x 30" table, 10" draw, 600 lbs. capacity.
3—TABOR, Size 30" x 40" Table, 12" Draw, 1000 lbs. Jolt Cap. Portable & Stationary.
4—TABOR, Size 22" x 32", and 22" x 42", Draw 10", Jolt 600 lbs.

JOLT PIN LIFT

2—DAVENPORT model 24 AJS, 24" x 30" table, 8" draw, 1000 lbs. capacity.
1—DAVENPORT No. 40 AJS, Table 44" x 54", Jolt 4000 lbs., Draw 18".
2—MILWAUKEE Model 2542, 38" x 42" table, 12" draw, 3000 lbs., jolt cap.
2—OSBORN No. 559, Table 25" x 30", Draw 6", Jolt 1200 lbs.
1—OSBORN No. 563, Table 55" x 63", Draw 12", Jolt 7000 lbs.
1—SPO model 307, 24" x 30" table, 8" draw, 1000 lbs. capacity. Portable.
1—TABOR, Table 22" x 32", Draw 10", Jolt 600#.

PIN LIFT

1—INTERNATIONAL Model LB 6, 8" draw, 750 lbs. cap.
1—INTERNATIONAL LP 10, 30" x 30" flask, 1000 lbs. cap.
2—MILWAUKEE No. 620 ND, 24" x 30" table, 2000 lbs. cap.

JOLT SQUEEZE PIN LIFT

1—INTERNATIONAL PKL, 12", Squeeze Cyl., 6" Draw.
1—MILWAUKEE 125-3, Table 21" x 27", Jolt 1200 lbs. Draw 8", Sq. Cyl. 12".
1—MILWAUKEE No. 163, Table 15" x 24", Draw, 8", Jolt 1500 lbs., Squeeze Cyl. 16".
1—OSBORN 175J table 18" x 21", draw 5" sq. cyl. 10".
2—OSBORN No. 710J Table 17" x 21", Squeeze Cyl. 10".
1—SPO 2114, table 20" x 27", 4" draw, 600 lbs. jolt, 11" cyl.
1—SPO 2146, table 21" x 31", 6" draw, 14" cylinder, portable.
1—SPO 2136G, table 19" x 26", 6" draw, 13" cyl. portable.

JOLT (BUMPERS)

1—DAVENPORT, model AJS, 20" x 30" table, 1000 lbs. cap.
1—HERMAN, 40" x 60" Table, 13" Cyl. 6000 lbs. Jolt.
1—MILWAUKEE No. 4050, 40" x 50" Table. 12" Cyl.
1—TABOR, Table 30" x 40". 2800# cap.

MATERIAL HANDLING EQUIPMENT

1—ERIE ¾ yard clamshell bucket, single line.
1—INGERSOLL RAND, Size MHU, Air Winch, 2000 lbs. Cap.
6—LEWIS SHEPPARD Platform Hand Lift Trucks (For Core Room).
1—LINK BELT car puller

CONVEYOR BELTING

1600'—HEWITT-ROBBINS 30" wide, 5 ply rubber covered. Used.
100'—HEWITT-ROBBINS 18" wide, 8 ply elevator. Never Used.

CONVEYOR BELTS

1—JEFFREY Trough, 20" x 35' centers.
1—JEFFREY trough, 24" x 75' centers.
1—JEFFREY trough, 24" x 103' centers.
1—LINK BELT flat, 24" x 40' centers.

STEEL APRON CONVEYOR

1—LINK BELT 36" x 100' centers, motor and drive.
1—LINK BELT 30" wide by 128' Apron Type Sorting Conveyor complete w/motor & Drives. Mounted on 36" High Stands.

VIBRATING CONVEYOR

1—LINK BELT 36" x 40'.
3—SIMPLICITY Model OA-10-A, 36" x 15'.

PORTABLE TROUGH CONVEYOR

1—FARQUHAR, 18" x 35'.

OSCILLATING CONVEYOR

1—LINK BELT 48" x 154'.

CHAIN CONVEYOR

500' JARVIS No. 678, complete with drives.

UNDER CAR UNLOADER

1—FARQUHAR, 18" x 19'.

TRAMRAIL

3—LOUDEN MONORAIL SYSTEMS, "Super Track"
(1) 110' of 6" I-beam & two 20' bridges
(2) 140' of 6" I-beam & two 12' bridges
(3) 130' of 11" I-beam & two 30' bridges: All Complete.
1—AMERICAN TRAMRAIL system with (1) 1 ton 20' span underslung bridge, and 150' of 12" tramrail, with air reels.
4—AMERICAN TRAMRAIL 2 ton cap. 20' span underslung bridge cranes. Complete.
2—AMERICAN TRAMRAIL 4 ton cap. 20' span underslung bridge cranes. Chain gear travel, complete.

OVERHEAD CRANES

1—WHITING 5 ton Overhead Crane, 50' span, Cab Operated, AC.

MOLD DRYERS

1—PORBECK Mold Dryer, 42" wide, 8' long, oil fired, Serial No. 242.

MOLD CONVEYOR

1—WEBB 109 Cars, Car Tops 32" x 39".

SAND MULLERS

1—BAKER PERKINS No. 16½, 30 HP motor.
1—CLEARFIELD, #414 Batch, 4 Cu. Ft.
1—CLEARFIELD, #610 Batch, 6 Cu. Ft.
1—BEARSLEY & PIPER No. 60 with loader, 75 HP motor.
1—SIMPSON, #1 Style B, Single Wheel, 400# Batch.
1—SIMPSON, #3 Style C, Enclosed Gears —3000#.
1—SIMPSON, #2, Style UD, 1500 lbs. Batch, With Loader.
1—SIMPSON, #2, Style C, 1500 lbs., with Loader. Enclosed Gears.
1—SIMPSON #1, style UD, 500 lbs. batch
1—DRAVO-DOYLE 6 Cubic Feet Capacity Wonder Model, portable, 5 HP 220/440
1—SIMPSON No. 1 Style B, 2 wheel, separate drive, with Aerator, 10 HP motor & Speed Reducer
1—SIMPSON Porto-Muller, 350 Lb Batch, portable
1—SIMPSON No. 1½, style UD, with loader, 700 lbs. batch.
1—SIMPSON No. 2, model H, 1000 lbs. cap. with loader.

SAND PREPARATORS

6—B & P Screenarators, Models—M & L.
1—PEKAY Aerator, Model 320-3. (For Sand System).
8—ROYERS, Models NDP-C-2, NC-4.
1—SIMPLICITY LP 2'x3', Portable, 3 HP.
1—NEWAYGO READY-SANDY, Model RSVM, shakeout, magnetic separation, etc.

SAND CUTTERS

2—AMERICAN Model M, 79/60.
1—AMERICAN, Model M-Size 99/80.
1—AMERICAN, Model M-Size 89/70.
2—MOULDERS' Friend 50" and 60" brush.

SAND SLINGERS

1—B & P, 19" Tractor Type, 13' Arm.
1—B & P, 16" Tractor Type, 13' Arm, Magnetic Tower, 4' Ramming 4" Tip.
2—B & P, Model 16S-DB Stationary Type, 16" Head.
1—B & P Stationary-Double Belt Model, 5' arm, 4' Ramming, 19" Head, 4" tip
2—B & P Swing Type Slingers, 16" Head

SHAKEOUTS & SCREENS

1—SIMPLICITY 4' x 6' Model B, 5000#.
1—SIMPLICITY 4' x 10' Model D, 16,000#.
1—ROYER Combination Shakeout & Sand Conditioning unit, Serial #ST-47.
1—HEWITT-ROBINS 36" x 78", Vibrex Screen, Style M-7.
1—LINK BELT 5' x 10' heavy dutv.
1—SIMPLICITY 6' x 8' Model DE, 16,000#

TUMBLING BARRELS

2—SLY 42" x 72" Square, 10 HP, Gearhead with Built-in Brake. Timken Bearing.
2—SLY 36" x 84" Type C, 7½ HP, Gearhead Built-in Brake. Timken Bearing.
4—WHITING 48" x 72", 10 HP Gearhead, with Built-in Brake. Timken Bearing.

WHEELABRATORS

1—AMERICAN 86" diameter swing table with dust collector.
1—AMERICAN No. 3 tablast, 4-48" auxiliary tables.
1—AMERICAN No. 1 tablast 7-14" auxiliary tables.
1—AMERICAN 27" x 36" Tumblast with skip hoist, shot return & electrical.
1—AMERICAN 36" x 42" Tumblast with Skip Hoist, Shot return & electrical.
1—AMERICAN 42" x 48" Tumblast, with Skip Hoist, Shot return & electrical.
1—AMERICAN 48" x 48" tumblast, with loader. New belt, excellent.
1—HOLLINGSWORTH Model 44" x 48" Tumblast.
1—HYDRO-BLAST cabinet, 40 HP motor and pump.
1—PANGBORN Shot Blast Room 10' x 12' x 14', with Dust Collector, Elevator.
1—PANGBORN 9LG, 9' Table, 8-24' Tables.

TESTING EQUIPMENT

1—GENERAL ELECTRIC X-Ray, Industrial Type. Model KX10, 140 KW.

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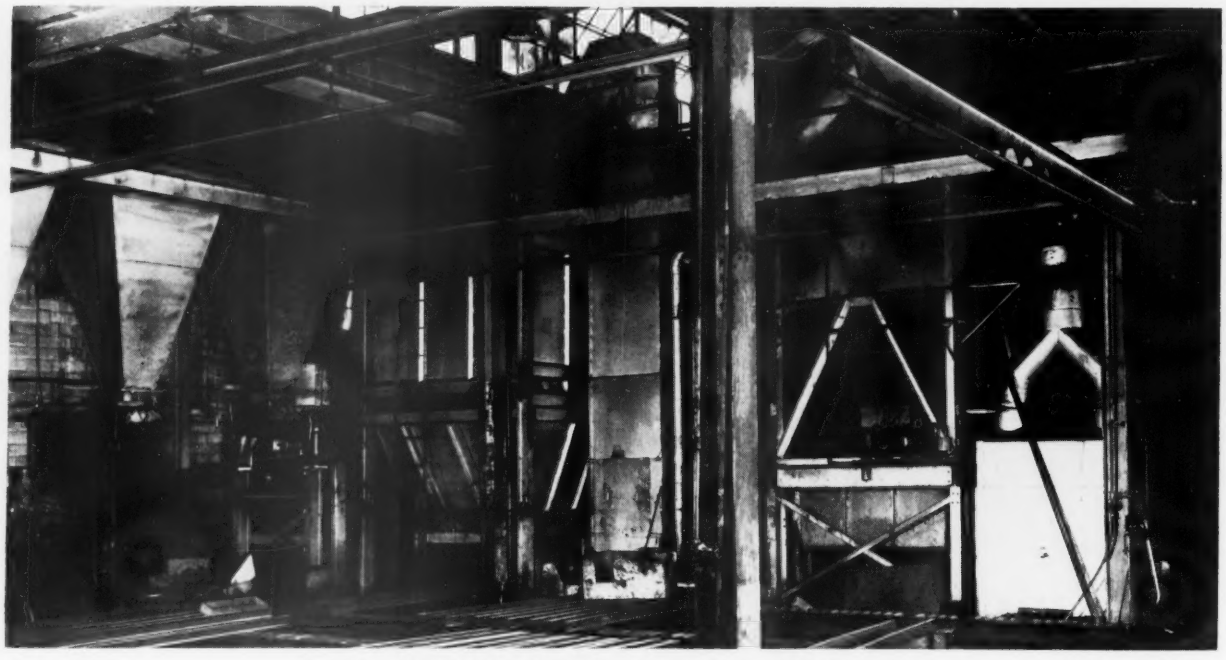

New 1948 **8 STATION OVERHEAD SAND SYSTEM** **25-Ton Cap.**

Consisting of:
1—SIMPSON #2 Sand Muller, with Bucket Loader and Aerator.
1—LINK BELT 25-ton cap. Sand Storage Hopper
1—LINK BELT 16″ x 80′ Distribution Belt Conveyor.
8—LINK BELT Molders Hoppers, 4′ x 4′ x 6′ long, with 12″ x 12″ gates and hand operated plows for molders station.
2—LINK BELT 24′ Bucket Elevators, 6″ x 8″ Buckets.
1—LINK BELT 16″ x 80′ Sand Spill Conveyor Belt.
3—LINK BELT Transfer Belts, various sizes.
400′ CLEVELAND Arch Beam Tramrail, with Bridges for pouring.
300′ MATHEWS 12″ Heavy Duty Roller Conveyor.
System complete with all structural steel, distribution belt, 14′ high.

CAN BE DISMANTLED AND MATCH MARKED FOR IMMEDIATE DELIVERY.

JEFFREY FLASK FILLER SYSTEM, Consisting of:
1—JEFFREY Paddle Type Sand Mixer, 48″ x 8′ long, with Motor and Reducer.
1—JEFFREY Revolving Sand Screen and 20″ x 18′ Belt Conveyor, with Motor & Drive.
2—JEFFREY Swivel Type Flask Filler Booms.
1—JEFFREY 40′ Bucket Elevator, 15″ x 8″ Buckets, 5 HP Motor & Drive.
1—JEFFREY Sand Storage Bin.
1—JEFFREY Leak-proof Apron Conveyor, 30′ long.
1—JEFFREY Distributing Belt Conveyor, 20″ x 100′ long, reversible belt.
1—JEFFREY Sand Spill Hopper and Belt Conveyor with Magnetic Pulley.
1—AMERICAN AIR FILTER Roto-Clone Dust Collector System, with 25 HP Motor.

MOLDING MACHINES

Used with above JEFFREY Flask Filler System:
2—HERMAN Jolt Rollover Pattern Draw Machines, 60″ x 84″ table, 10,000 lb. jolt capacity, 20″ jolt cylinder.
2—HERMAN Jolt Rollover Pattern Draw Machines, 40″ x 60″ table, 4000 lb. jolt capacity, 13″ jolt cylinder.

CAR TYPE MOLD OVENS

1—COLEMAN Metal Insulated Car Type Mold Oven with combination gas and oil burners, completely recirculating air heat system, O.D. 17′4″ wide, 25′3″ long, 13′ high; door opening 14′4″ wide x 12′6″ high; oven walls and roof constructed of interlocking type unit panels containing 5″ reinforced rockwood insulation; doors are jack-knife hinged type. Oven equipped with Brown recording controller and high limit temperature controller and all necessary safety equipment and controls. Complete with 2 cars. *LIKE NEW*

1—COLEMAN Metal Insulated Car Type Mold Oven with combination gas and oil burners, completely recirculating air heat system, door opening 15′ wide x 8′ high x 20′ long; oven walls and roof constructed of interlocking type unit panels containing 5″ reinforced rockwood insulation; doors are jack-knife hinged type. Equipped with Brown recording controller and high limit temperature controller and all necessary safety equipment and controls. Complete with 1 car. *LIKE NEW*

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THE ACME BARGAIN PAGE

AIR COMPRESSORS
Ingersoll Rand Type 10, 800 CFM, 2 stage air compressor, 200 HP, 220 V motor. Rebuilt 1952.

AIR HOISTS
3—4000# Ingersoll-Rand, with trolleys.

BLOWERS
Ingersoll-Rand Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220V G. E. Induction motor.
General Electric 7500 CFM, 20 oz., 89.6 Max. HP, 220V motor, Airway controls.
Ingersoll-Rand turbo compressor 10500 CFM @ 20 oz. 85 HP G. E. 220V 3500 CFM motor.

CORE BLOWERS
3—International SB 12.
4—International SB 13.
10—Osborn 193.
1—Osborn 2035-2.
1—Champion CB 400.
2—CB 10 Late Type.

CORE GRINDERS
4—Milwaukee 70-9.

CORE OVEN VERTICAL HORIZONTAL
1—Coleman, combination oil or gas fired 43 carriers 24″ x 90″—1 hour 12 min. to 4 hours 48 min. cycle.
1—Coleman, combination oil or gas fired 43—2 shelf carriers 30″ x 144″ long. 2 hour 12 min. to 7 hour 24 min. cycle. Present replacement cost over $90,000.

CORE PASTE OVENS
2—Coleman Gas Fired 28′-25″ x 42″ opening.

CRANES
1—Milwaukee 10 ton 40′ span, 22′ lift, 220 V. A.C.
2—Northern 5 ton 40′ span, 22′ lift, 220 V. A.C.
1—Whiting 5 ton 40′ span, 22′ lift, 220 V. A.C.

ELECTRIC MELTING FURNACES
Detroit Electric 1500#—Kuhlman 13200 volt transformer complete with controls.
Detroit Electric 350#—Kuhlman 13200 volt transformer and controls.

FURNACE TRANSFORMERS
We have Electric Furnace Transformers in stock from 800 KVA to 2500 KVA. Write us your needs.

GRINDERS
Horizontal Disc (Flat) Grinders:
Gardner #186, 30″ dia. disc. 10 HP, 220/440V, with dresser, wet or dry grinder.
Double End Disc:
1—U.S. 18″ wheels, 2 swing tables.

GRINDERS, SNAGGING
2—Hammond 10 WRI D. E. Snag. 20″ dia. wheels, 10 HP 220/440 v motors, variable speed drives.
1—3″ x 24″ U.S. #65, 20 HP 220/440V.

GRINDERS, SWING FRAME
2—3″ x 24″ x 12″ Fox #4, 15 HP.
1—3″ x 24″ x 12″ Marschke, 20 HP.
1—3″ x 24″ x 12″ U.S. 15 HP.

HOT METAL CARRIERS
3—1 ton D.C. Cab operated Cleveland, Monotractor Hot Metal Carriers.

MOLDING MACHINES
Jolt Squeezers:
5—Milwaukee 103-11 Staty. Jolt Squeezers, 13½″ x 20″ table.
7—Champion JS10P Portable Jolt Squeeze molding machine, 18″ x 21″ table.
10—Osborn 275J.
Jolt Squeeze Pin Lifts BIG
2—Milwaukee Jolt Squeeze Strippers, Model 163-50, 15″ x 24″ table 16″ X open end pattern size.
1—Milwaukee 126-3 Jolt Squeeze Pin Stripper, 27″ x 21″ table, 8″ draw. Portable.
2—#165 Milwaukees.

ROLLOVERS
1—Herman 4000# Series 30″ x 60″ table.
1—Herman 3000# Series 40″ x 84″ table, special slotted table.
1—Herman 1500# Series 20″ x 36″ table.
2—Herman 750# Series 20″ x 30″ table.
2—Herman 750# Series 20″ x 24″ table.
1—Davenport 24 SA Jolt Rollover Pattern Draw. 26″ x 42″ flask size, 12″ draw.
3—Spo Model 9032.
1—Milwaukee 217.
2—International Type G, Portable, 20″ x 8″ draw.
3—Tabor Portable Rollover 30″.
Johnson & Jennings 1020-44 x 44 max. Flask Size.

PIN LIFT PUSHOFFS
1—Champion Pin Pushoffs 28″ x 42″ table 10″ draw.

4 No. 2 Simpson Mullers U D

OVENS, CORE
Despatch Type S, 2 cars 27½ x 54 x 64, Gas Fired.

OVERHEAD TROLLEY CONVEYORS
5000′ Jervis B. Webb & Link Belt 658 chain, 4 D.C. motor drive and MG set.

POURING DEVICES
3—Pouring devices, Whiting 500#.

SAND SLINGERS
B & P Motive Sand Slinger 19″ 2 speed head
B & P Tractor type 13′

SANDBELT CONVEYORS
160′-30″ Trough with Drives.
144′-30″ Flat with Drives.
47′-30″ Trough with Drives.

TUMBLING BARRELS
3—Royersford 42′ x 72′ Roller Bearing, Chain Drive.
1—Sly Square 42 x 42 x 64.
1—Sly 42″ Dia. x 56″.

WIRE STRAIGHTENERS
American type F Rod Straightener
Lewis 2C ⅛ to ¼″ cap.

WHEELABRATORS
1—27″ x 36″ Rubber Belt Wheelabrator

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ACME EQUIPMENT CO., INC.
We will buy for cash a single piece of equipment or your entire foundry
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BARGAIN PRICES

GUARANTEED REBUILT EQUIPMENT

AIR COMPRESSORS

4—BURY, 2 stage, 17" x 10" x 14", 150 HP, 3/60/220/900 rpm, w/controls
1—PENNSYLVANIA, 2 stage, 20" x 12" x 14", 225 HP syn. motor
1—SULLIVAN, 16" x 19"Y, 125 HP, 3/60/440
1—INGERSOLL-RAND, 2 stage, 35 HP, 200 CFM

BLOWERS

25—CENTRIFUGAL, 16 ounces, 2 HP to 5 HP
5—WILBRAHAM-GREEN Positive Pressure, various sizes
1—G.E. Cupola Blower, 85 HP, 10,500 cfm, 20 oz.
1—G.E., 30 HP, 5700 cfm, 12 oz.
1—FISHER, 7½ HP, 500 cfm, 16 oz.

CLEANING EQUIPMENT

1—AMERICAN WHEELABRATOR TUMBLAST, 48" x 48" w/loader
1—AMERICAN WHEELABRATOR TUMBLAST, 42" x 48" w/loader
1—PANGBORN TABLAST, 8' Table
1—PANGBORN ROTOBLAST, #BVR-5
1—PANGBORN ROTOBLAST, #28, Type GK
1—PANGBORN BLAST CABINET, #EP-5
3—TANNEWITZ METAL CUTTING BANDSAWS, 30" and 36"
1—TABOR ABRASIVE CUT-OFF SAW, Model C-10-AF, 10 HP
1—CRESCENT METAL CUTTING BANDSAW, 30"
4—BURRING BENCHES, Magnesium cleaning, 9' L x 30" H x 30" W

CONVEYORS

1—LINK BELT, vibrating, double deck, 80' x 24", w/exhaust hood
1—LINK BELT, 21'6" x 24", with drive
1—LINK BELT, Car type mold, 114 cars, 403' track, car size 18" x 42"
1—JEFFREY, 3 compartment, ingot mold, Variable speed, remote control
1—CORE ROOM, #678 chain, with I Beam and drive
4—SAND ELEVATORS, Various sizes
6—SAND BELTS, 10' ctrs. to 140' ctrs., 18" to 36" belt, complete
2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES

CORE BLOWERS

4—DEMMLER #1
3—DEMMLER #2, vert. or horiz. clamping
1—DEMMLER #3K
1—DEMMLER #55, late model
1—OSBORN #91
1—OSBORN #92
1—CHAMPION, Model CB-12
1—CHAMPION, Model CB—400
1—INTERNATIONAL SB-13

CUPOLAS

2—WHITING #5 complete with Skip Charger and Blower
2—WHITING #9 with Blower
1—MORRIS #9, Skip charger, Blower, Mixing Ladle, Never Installed

1—SKIP CHARGER for #9 Cupola with scale and buckets
10—CHARGING BUCKETS, 38" Dia. x 35" High, cone bottom
1—TROPENAS CONVERTER, 2 ton, side blow with blower

DUST COLLECTORS

1—PANGBORN, style 635, 7800 cfm, 15 HP motor
4—ROTOCLONE, #12, Type N, wet type
1—ROTOCLONE, #16W
2—ROTOCLONE, Size 20D, Hopper type F

FLASKS

150 HINES AND FREEMAN ALUMINUM, Popoffs and Jackets
200 TRANSITE CORE PLATES, Various Sizes
100 Tons STEEL FLASKS
SEND US YOUR REQUIREMENTS

FURNACES—DIRECT ARC MELTING

1—3,000#/hr. LECTROMELT
1—3 Ton/hr. LECTROMELT
1—2,000#/hr. HEROULT
1—6 Ton/hr. HEROULT
1—250#/hr. Single Phase

FURNACES—INDIRECT ARC

1—350#/hr. DETROIT, Complete
1—1,000#/hr. DETROIT, Complete
1—2,000#/hr. DETROIT, Complete

FURNACES—INDUCTION MELTING

2—333 KW, AJAX-TAMA-WYATT, 1500# Alum., 60 cycle
1—333 KW, AJAX M.G. Type with Furnaces, 960 cycle
1—175 KW, AJAX, 60 cycle, complete
2—60 KW, AJAX, 400#/hr. alum., 60 cycle
1—50 KW, G.E. MG Set, 960 cycle
1—30 KW, LEPEL
1—20 KW, AJAX SPARK GAP, High Frequency
1—15 KW, TOCCO MG Set, 10,000 cycles
1—3 KW, AJAX, Lab type

FURNACES—GAS & OIL

1—FISHER MNP, Gas, Tilting, 1700# cap. Mag.
3—FISHER, Gas, Stationary, 4 Burner, 500# cap.
7—FISHER MNP, Oil, Tilting, with blowers, 500# cap. Alum.
7—FISHER MNP, Oil, with blowers, 1500# cap. Brass
5—FISHER, Oil, Stationary, model 125, type S, Brass
1—DEMPSEY, Reverberatory, 10,000#, 9' W x 14' L x 9' H, Oil
1—HAUSFELD, Gas, Stationary, 1000# cap.
1—HAUSFELD, Oil, 600# Cap.
1—CAMPBELL-HAUSFELD, 100-125 Crucible, Gas
1—SKLENAR, Oil, 600# Cap.
1—STROMAN, Gas, Tilting, 1,000# cap. Alum., auto control, hyd. lift

MOLDING MACHINES

Jolt Rollovers

1—J & J #1020, 50" x 60", 20" draw
2—J & J #918
1—J & J #815, 30" x 40", 15" draw, 1200# jolt
1—J & J #612, 24" x 30", 12" draw
3—J & J #610, 24" x 30", 10" draw
1—INTERNATIONAL, Type G, 24" x 10"
1—HERMAN 10,000#, 48" x 109" table
2—HERMAN 1500#
1—HERMAN 750#, 30" x 36"
1—SPO #506, Portable
1—OSBORN #602
1—OSBORN #601, 30" x 24", 10" draw
2—OSBORN #405-86, with levelling carriage
1—OSBORN #405, 3,000#, flask size 64" x 50", 18" draw
1—OSBORN #333
1—OSBORN #332
2—OSBORN #243, 27" x 40", 20" draw
2—OSBORN #242, Rockover draw, w/oil cylinder and operating valve
5—OSBORN #142, 15" x 20", hand draw
1—TABOR, 30" x 40" with air clamps
5—TABOR, 22" x 42", pattern draw, shockless, portable
1—TABOR, 22" x 32", with air clamps
2—TABOR, 14" x 16" Rockover
1—MODERN #440, Cope and Draw

Bumpers

2—DAVENPORT, 30" x 30" table
1—DAVENPORT, 24" x 27" table

Jolt Strippers

2—J & J, 30" x 24" table, 600# cap.
2—SPO #305, 20" x 27" table, 750# cap.
1—HERMAN, 22" x 30" table, #4317
1—TABOR, 20" x 20" table, hand strip
1—MILWAUKEE #1536, 32" x 38"
1—INTERNATIONAL 1255 PKL

Jolt Squeeze Strippers

1—OSBORN #175, 21" x 18", portable
2—SPO #2136, 21" x 30", 800# cap. 13" cylinder
1—MILWAUKEE #165
2—MILWAUKEE #163

Jolt Squeezers

1—SPO #113J, Portable
8—SPO #110J, Portable
3—OSBORN #276-J, Cantilever
4—OSBORN #275-J, Portable
13—OSBORN #275PJ, Stationary
2—OSBORN #712PJ, Stationary
1—OSBORN #212PJ, 17" x 23", Stationary
4—INTERNATIONAL, #12 LJS
3—TABOR, Squeeze-in-head, 16" x 18"
4—TABOR, 3" jolt, 18" x 20", Cantilever
2—HAYNES, 17" x 20", 10" squeeze, portable

MULLERS AND MIXERS

1—SIMPSON #0, 3' Dia., 1½ to 1¾ cu. ft.
1—SIMPSON #1, 4' Dia., 4 cu. ft.
1—SIMPSON #1½, 4½' Dia., 5 to 6 cu. ft.
1—SIMPSON #2, with loader, 6' Dia., 14 cu. ft.
1—SIMPSON #2, 6' Dia., 14 cu. ft.
1—SIMPSON #3, 8' Dia., 25 to 30 cu. ft.
1—B & P SPEEDMULLOR, #60, 5'2" Dia., 12 cu. ft.
1—B & P SPEEDMULLOR, #70, 6'4" Dia., 18 cu. ft.
1—B & P SPEEDMULLOR, #80, 6'6" Dia., 24 cu. ft.
1—CLEARFIELD, #610, 6' Dia., 10-14 cu. ft.
1—CLEARFIELD, #920, 9' Dia., 25-30 cu. ft.
4—BAKER PERKINS, #4A

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2—WHITING, 3 Ton, Bottom Pour
1—TREADWELL, 45 Ton, excellent condition
1—SWINDELL, Electric, for holding
4—MODERN Pouring Devices, F-9
1—800#, Lip pour, worm geared
2—1500#, Tea Pot, worm geared
2—3 Ton, bottom and lip pour
1—8500# Lip pour, worm geared
2—5 Ton, worm geared
2—10 Ton, Bottom pour, 55" x 55"
1—40 Ton, Lip pour
7—45 Ton, Bottom pour, All rigged
7—75 Ton, Bottom pour, No rigging

UNIVERSAL MACHINERY AND EQUIPMENT CO.

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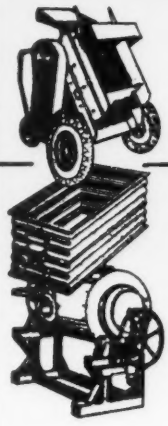

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JOLT SQUEEZE STRIP MOLDING MACHINES

2—#724 Osborns
2—Model 24-54D Nichols

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1 Palmer-Bee 21″ x 5′6″
Bucket—2-40′, 3-50′, 8″ x 16″ buckets
Mold—1—Webb 356′ lg., 109 cars 32″x39″
1—Link-Belt 200′ lg. 35 cars 38″ x 72″.

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1—3 ton Shepard—Monorail 25 HP, 550 DC.
1—Chisholm-Moore Cupola Charging with 200′ rail 550v 3/60
3—Pouring off, cab operated, Monorail

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MAGNESIUM CLEANING CABINETS:

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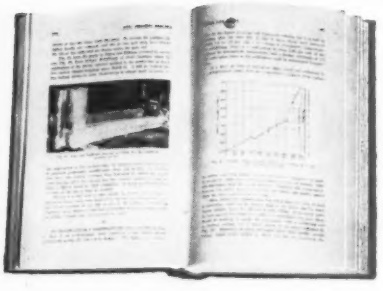

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ABOUT THE AUTHOR

The late John Howe Hall was associated with the production of steel castings for nearly 50 years. Mr. Hall received his bachelor's and master's degrees from Harvard University. He was employed by Bethlehem Steel Co. and Buffalo Crucible Castings Co. until 1906, when he joined Taylor-Wharton Iron & Steel Co. He remained there until 1937, when he became a consulting metallurgist. His previous major work was The Steel Foundry, *published in 1914, with a second edition in 1922.*

Mr. Hall was the author of many papers presented before the American Society for Testing Materials, the American Foundrymen's Society, the American Institute of Mining and Metallurgical Engineers and the American Society of Mechanical Engineers. In 1924, he received the first Whiting Medal awarded by the AFS.

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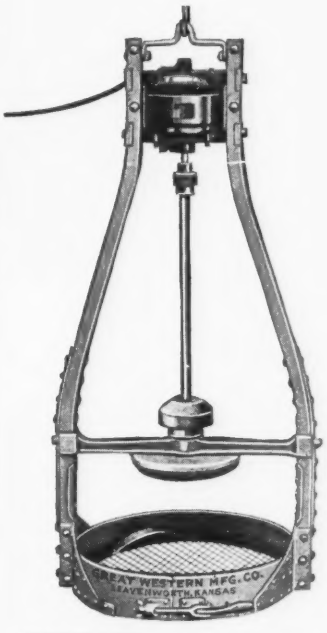

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with 20" sieve ...$275.00
also made with
36" sieve $495.00

TYPE "HL"
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for sand control
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TYPE "CS"
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LEAVENWORTH, KANSAS

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Next Page—ITEM 751→

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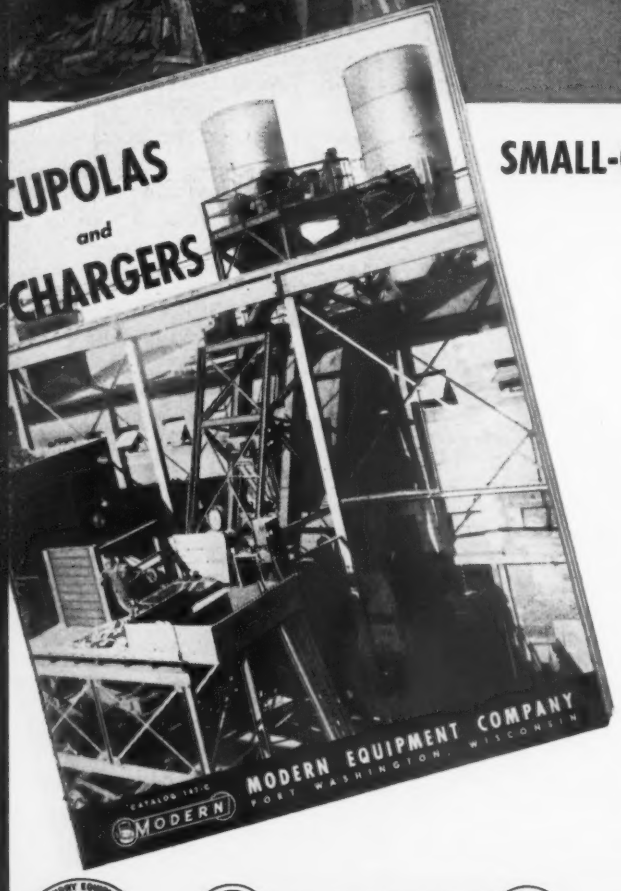

SMALL-CONE ORANGE-PEEL BUCKET CYCLES IN 3 MINUTE

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- Magnet-crane charges the pig directly into scale-mounted weigh hopper . . .
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- Components, weighed automatically, are recorded on tape in the scale head . . .
- Stock-line indicators control stock level in cupolas . . .
- Settling tank, beneath the bins, receives the cupola slag which is removed by slat conveyor . . .

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- ☐ Mail new catalog on cupolas and chargers, 147-C.
- ☐ Mail catalog on ladles and pouring devices, P-152-A.
- ☐ Ask a representative to call.

COMPANY .....

STREET ..... ZONE ..... BOX .....

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MY NAME .....

MEMBER FEMA

MODERN

NEW...FOR YOU FROM STEVENS

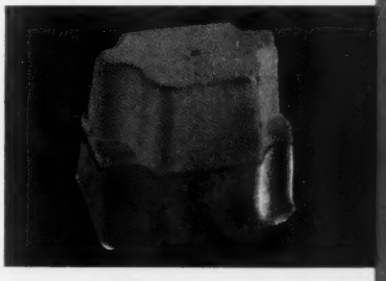
THESE NEW PRODUCTS WILL IMPROVE YOUR FOUNDRY OPERATIONS

IGNICOAT—FAST DRYING MOLD SPRAY

Eliminates lengthy drying of mold coating by torch or oven. Can be sprayed, brushed or swabbed. Ignicoat mixes rapidly with isopropyl alcohol and contains the proper percentage of binder to insure good film adherence to the sand. When ignited, burns with a gentle flame. Molds may be closed and poured as soon as burning stops.

RED-SKIN CORE COATING

Does not run, streak, tear-drop or pile up at the edge of the core. It is a refractory type core coating that insures clean peel of sand from castings. The new Stevens Red-Skin reduces costs and aids in the production of better castings when used on molds and cores for steel, grey iron and non-ferrous metals. Red-Skin has deep penetration and seals several layers of sand, to prevent metal penetration.

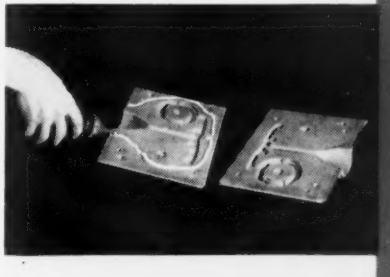


GRAPH-KOTE COATING

Graph-Kote is a "short" coating which means a sharp dip line. It coats only where the coating is needed, assuring accurate fitting of core prints and assemblies. Cores can be dipped faster and its even uniform coating gives ample coverage to produce clean castings. In its original paste form, Graph-Kote can be stored indefinitely in the original Stevens polyethylene lined drums.

NEW IMPROVED FASTICK LIQUID CORE PASTE

Has very rapid air or oven drying qualities. Gives excellent results with resin-bonded cores and shell molds. Permits elimination of clamps on shell mold halves. Strength is not reduced at high temperatures. As a time saver, Fastick will reduce your costs as it is mixed and ready to use when received.



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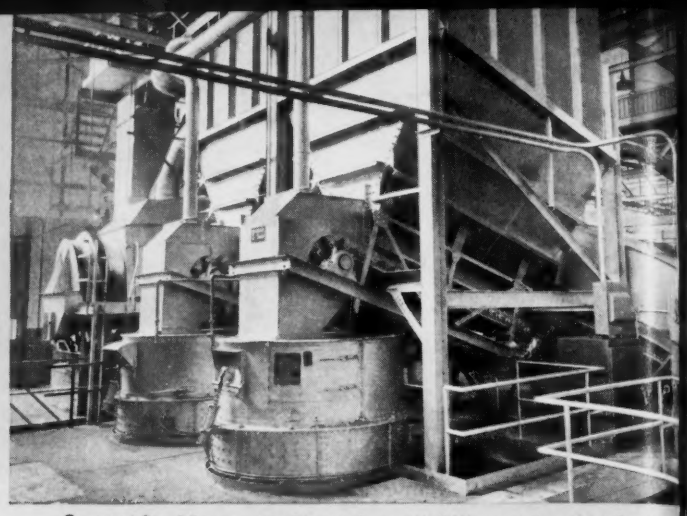
WRITE TODAY FOR TRIAL ORDER OR AN "IN-PLANT" TEST ON ANY OF THESE NEW STEVENS PRODUCTS

Sand Preparation Plant Showing Storage Bins, Weigh Hopper and Muller.



Compact Sand Preparation Plant in Large Mid-Western Gray Iron Foundry.

Sand Preparation Systems

engineered for YOUR exact requirements

Bartlett-Snow systems assure unvarying uniformity of sand quality — more molds per day — better castings — less scrap — increased production — lower costs.

● Complete facilities include collection of shakeout and strike-off sand — cooling — screening — adequate storage — mixing — aeration and return to molders. Fixed responsibility assures highly efficient synchronized operation of the entire system as a unit. Rugged construction assures low maintenance and low operating costs. Many steel, malleable, gray iron and non-ferrous installations.

DESIGNERS ENGINEERS

BARTLETT B-SNOW
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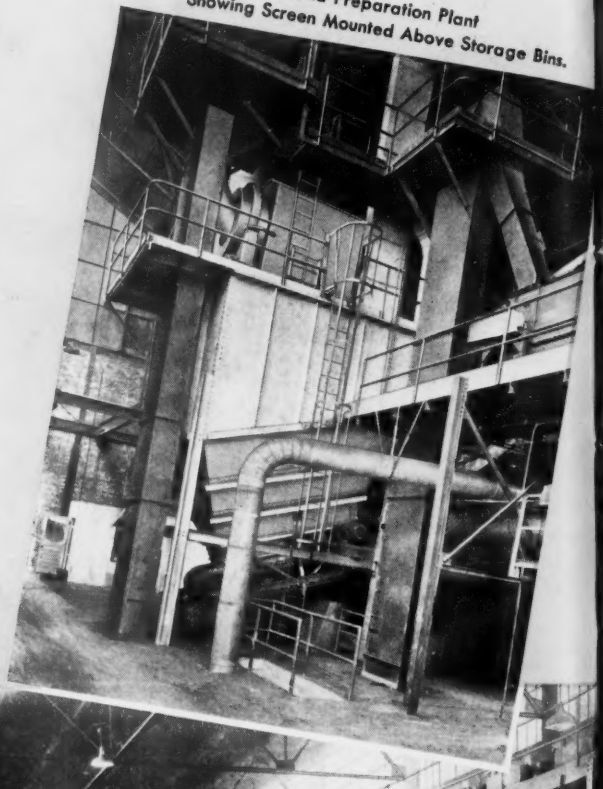
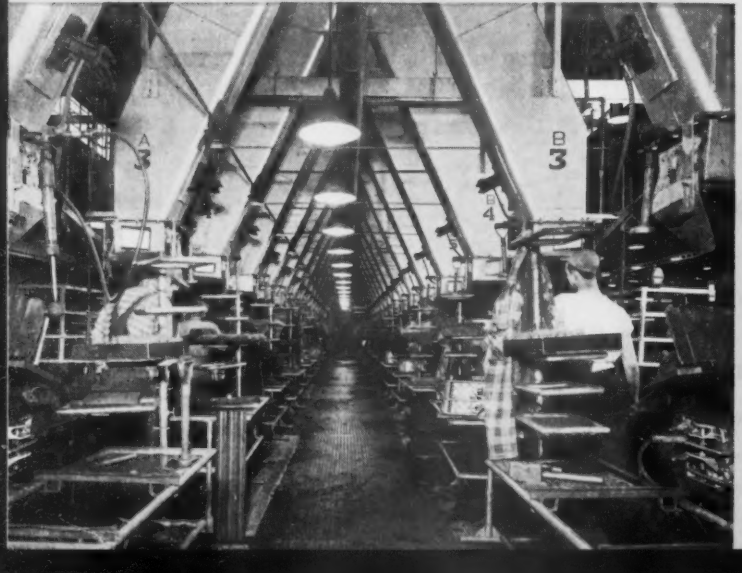
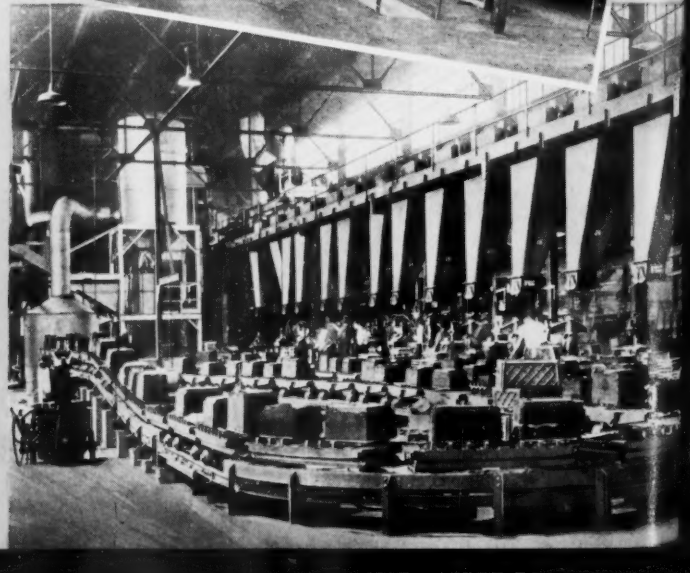
FABRICATORS ERECTORS

Foundrymen Who Know — Buy Bartlett Snow

Sand Preparation Plant
Showing Screen Mounted Above Storage Bins.







Below—Left: Overhead Return of Prepared Sand to Molders. **Below—Right:** General View of Large Jobbing Foundry Showing Sand Plant, Molders Hoppers and Mold Conveyor.